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DEVICES AND TECHNIQUES FOR USE IN FUNGICIDE TESTING*

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INTRODUCTION

IN its screening program, the Fungus Control Section of the U S Army Engineer Research and Development Laboratories at Fort Belvoir, Virginia, has, during the past decade, treated thousands of fabric, paper, and wood samples with hundreds of fungitoxicants. During this period several devices and techniques were developed that have proven to be valuable in obtaining more reproducible test results and increased production in certain routine procedures. Also some tasks have been made less fatiguing and certain operations made more safe.

Although other laboratories may have developed identical or even better methods, it is hoped that a description of these items may be of some value to workers in the same or related work.

I. A CABINET FOR THE HORIZONTAL DRYING OF TEST FABRICS[1]

In the past, strips of cloth, freshly impregnated with toxicants, were air-dried by suspension from a line. This caused an uneven distribution of the fungicide by migration of the solvent to the lower portion of the strip. This uneven distribution of the toxicant resulted in considerable variation of breaking strength losses when the impregnated fabrics were subjected to soil-burial and other tests. The toxic and sometimes explosive fumes that were often liberated during drying presented hazards that required safety measures. Since the wearing of a respirator is uncomfortable, it was often discarded.

These difficulties were eliminated by constructing a cabinet (Fig 1) in which the impregnated strips could be dried in a horizontal position to prevent migration of the solvent. Connecting this cabinet to the exhaust system permitted the removal of fumes as soon as they were liberated.

The cabinet, fabricated from 16-gauge cold-rolled steel, is 32 inches high, 35 inches deep and 54 inches across the front. It is connected to the exhaust system by a six-inch, damper-controlled vent pipe. The seven bottomless drawers have an inside depth of one inch. Under the cabinet is sufficient space for the installation of steam pipes or some other source of heat.

Each bottomless drawer is provided with two pin-studded bars, similar in construction to a curtain stretcher, to which strips can be attached. One of these bars is permanently fastened to the drawer frame, while the other is adjustable. By placing this movable bar in the proper set of notches that run parallel with the front and back of the drawer, one can dry fabric strips that vary from 32 to 48 inches in length. Alternating the fixed bar from right to left in successive drawers permits better circulation of air.

After a strip has been affixed to the pins, the partial closing of the drawer places the fabric in the air stream of the exhaust system. This not only hastens the drying process but prevents contamination of the atmosphere with volatiles while the next strip is being prepared.

The dimensions of the cabinet and the number of the drawers can be modified to meet the requirements of the particular laboratory where it is to be used.

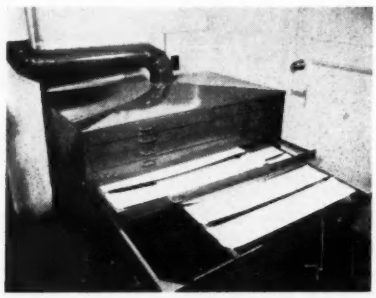

Figure 1
A cabinet for the horizontal drying of test fabrics. The fabric strips are held in place by pins protruding from fixed and movable bars.

II. CONDITIONING AND STORAGE TRAYS[2]

When a large number of samples are to be conditioned in a constant temperature and humidity room, the limiting factor is usually the available table or shelf space. In order to obtain uniform conditioning, samples should be spread out singly and not piled one upon the other. A maximum number of samples can be conditioned in a minimum amount of space by the use of the conditioning tray shown in Figure 2-A. A stack of ten of these trays (Fig 2-B) occupies a space that is only 17 x 25 x 18 inches in size yet will provide almost thirty square feet of drying or storage space.

The trays, constructed from ¼-inch plywood, are 17 x 25 inches in size with 1½-inch legs made from ⅞-inch wooden dowels. These legs not only permit stacking but allow free air circulation during the conditioning period.

A more efficient conditioning tray can be made by substituting a suit-

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[1]Any device or technique not credited to other individuals was designed by the author.

[2]Designed by J M Ashcroft, consultant, U S Army Engineer Research and Development Laboratories, and the author.

able wire mesh screen for the plywood base. This would necessitate the fastening of the wire to a wooden frame.

Trays of this type can be adapted for a variety of uses, ranging from the drying of washed fabric specimens after soil burial to the providing of temporary storage space for accumulated samples.

III. PREVENTION OF SAMPLE SLIPPAGE IN THE JAWS OF TENSILE STRENGTH TEST MACHINES[3]

When fabric or rubber test samples are broken by the Scott Tester, an appreciable number of them tend to slip from the grip of the steel jaws regardless of the pressure exerted to tighten the clamps. When this occurs, the breaking strength determination obtained for that specimen may not be a valid one.

This difficulty was resolved by vulcanizing a layer of rubber to the contact surface of each removable jaw. To obtain a firm bond between the metal and the rubber, a wedge-shaped groove, ½-inch deep by ½-inch wide at the bottom and ¼-inch wide at the top, was cut from the entire length of the contact surface of the two removable jaws. The entire gripping surface of the jaw was covered, and the groove filled with a rubber compound,[4] which was then vulcanized in a suitable mold for 50 minutes at a temperature of 284° F.

These vulcanized jaws are still serviceable after six years of constant use. Not only has slippage been reduced to practically zero but less effort is required to tighten the jaws.

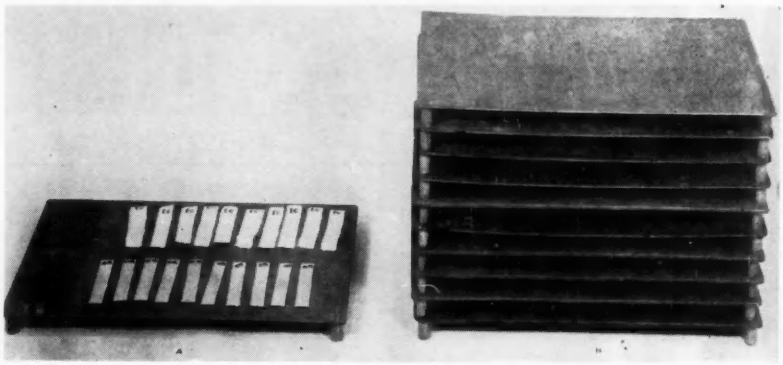
It is believed that almost comparable results can be accomplished by the use of one of the self-vulcanizing types of rubber-to-metal adhesives, which are reputed to have excellent adhesion and very high shear strength.

IV. A CUTTING DIE FOR THE PREPARATION OF FABRIC STRIPS FOR CHEMICAL ANALYSIS

The hand shredding of fabric into pieces that are sufficiently small for analytical purposes is a tiresome and time-consuming task. A cutting die[5] (Fig 3-A) was designed to punch out one-half inch discs (Fig 3-B) simultaneously from many folds of fabric. Since the discs are punched out of several layers of the sample at the same time, a degree of randomization is also obtained during the operation (Fig 3-C).

The cutting portion of the die is a series of eight[6] cylindrical tubes of tool steel, having an inside diameter of one-half inch and a wall thickness of one-eighth inch. One end of each tube is sharpened to a cutting edge. These tubes are set into corresponding holes drilled into 2½ x 4 x ⅝-inch base of tool steel. All cutting tubes are securely anchored in place by the use of Allen screws, which also make their removal for sharpening or replacing a simple operation. A steel handle affixed to the upper surface of the base permits the application of pressure by means of an arbor press.

In use, the die is placed in the press over a number of folds of cloth, and pressure is applied to punch out discs from all layers of fabric at the same time. After several punches it is necessary to push out the material from the tubes with a dowel or pencil. The samples are then ready for weighing, ashing or for any other analytical procedure without further cutting or shredding.

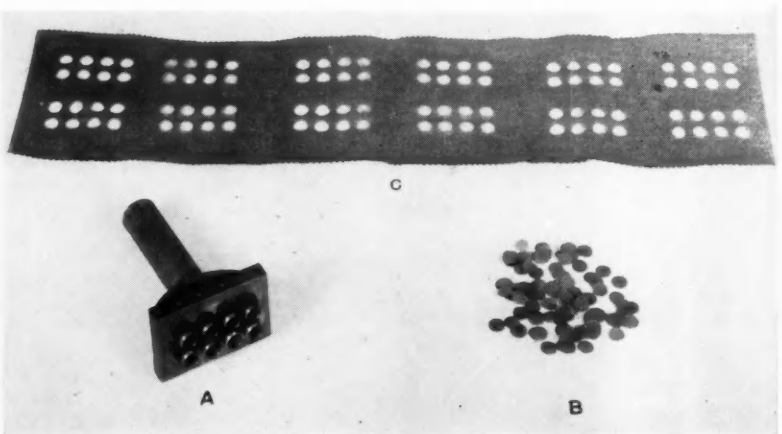


A B

Figure 2
Conditioning and storage trays
A—A tray in use
B—Ten stacked trays occupying 17x25x18 inches yet providing almost 30 square feet of storage space

V. A DOWN-DRAFT VENTILATOR SYSTEM FOR USE WITH THE LABORATORY PADDER[7]

The volatile solvents that are used for fabric impregnation with a laboratory padding machine create a safety hazard which cannot be eliminated through the use of the con-



C

A B

Figure 3
A—A cutting die for the preparation of fabric samples for chemical analysis
B—Samples of the cut fabric ready for ashing
C—A fabric strip showing the area sampled by two cuttings

[3]Designed by J M Ashcroft.

[4]Rubber formulation: Smoked sheets, 100.00 parts; stearic acid, 5.00 parts; Flectol H, 1.00 part; Santoflex A W, 2.00 parts; zinc oxide, 5.00 parts, H P C Black, 65.00 parts; sulfur, 2.75 parts; Captax, 0.50 part; Altax, 0.50 part; Tuads, 0.10 part.

[5]The author is indebted to Woodrow Thurston, laboratory machinist, U S Army Engr Research & Dev Labs for his help and suggestions in the fabrication of this die.

[6]The dimensions and the number of individual cutting dies can be changed to meet the specific requirements of the user.

[7]Designed by J M Ashcroft and the author.

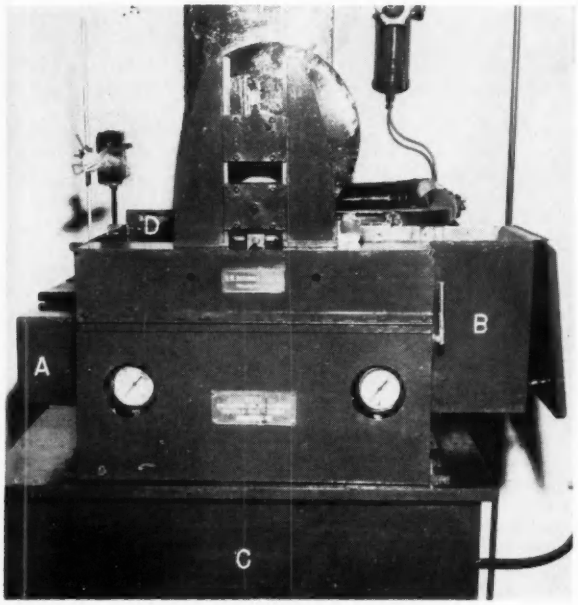


Figure 4
Butterworth laboratory padder modified to remove volatile fumes by the use of a down-draft exhaust system
A, B, C—Sheet metal enclosures
D—Slotted duct for removal of fumes from vicinity of rolls

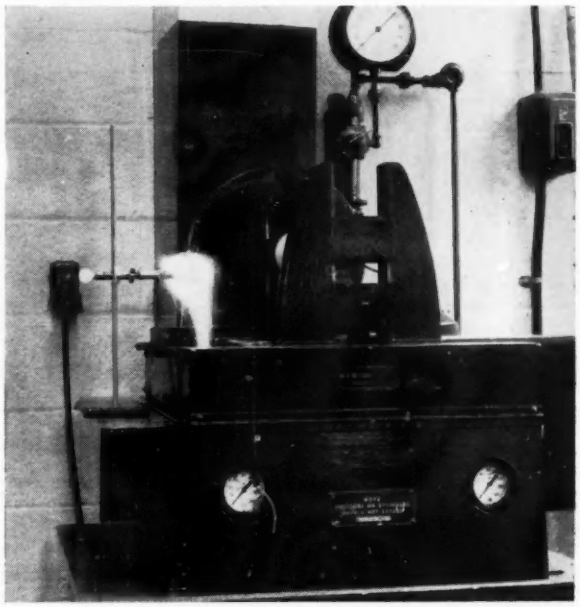


Figure 6
Down-draft ventilator system for use with laboratory padder. The downward direction of the flames from the crucible of burning oil illustrates the efficiency of the down-draft system

ventional canopy type of fume hood. The updraft created by this type of hood constantly exposed the operator to the liberated fumes. The wearing of a respirator does much to minimize this respiratory hazard but its use is both uncomfortable and bothersome.

A down-draft type of ventilating system that prevents the fumes from reaching the level of the operator's face was designed. Both ends of a Butterworth Laboratory Padder (Figs 4-A and 4-B) as well as the four sides and the bottom of the supporting stand (Fig 4-C) were completely enclosed with sheet steel. This enclosed area was connected to the exhaust system (Fig 5-A). An air scoop (Fig 5-B) was placed directly under the enclosure to remove any fumes that may seep through. To remove fumes that may be liberated as the fabric passes between the squeeze rolls, a slotted 1 x 1¼-inch duct (Fig 4-D) was installed on one side, at right angles to, and under the lower roll of the padding machine. In order to install this duct, it was necessary to reduce the size of the shaft on one side of the lower roll. This reduction in size does not affect the operation of the machine.

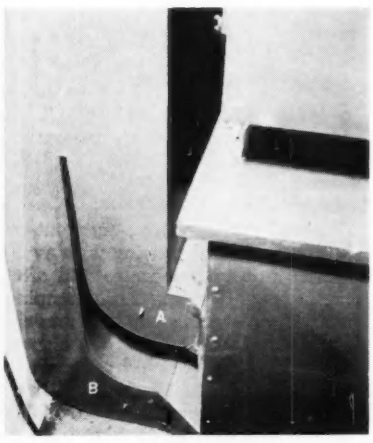


Figure 5
Down-draft ventilator system for use with laboratory padder
A—Connection of enclosed area to exhaust system
B—Air scoop placed directly under enclosure to remove any fumes that might seep through

The efficiency of this down-draft ventilating system is vividly illustrated in Figure 6 by the downward direction of the flame from the burning oil in the crucible.

To meet specific needs of our laboratory, a removable "dip" tank (Fig 7-A) was made. A curved flange on one side of this tank is used to attach it to the dip-tray under the rolls. Since this tank is suspended within the down-draft enclosure (Fig 7-B), all vapors are immediately pulled into the exhaust air stream as soon as they reach the top of the tank. A hinged lid retards evaporation and subsequent changes in concentration during non-operating periods.

VI. A TEMPLATE AND A FINGER-CLIP RULER FOR THE RAPID PREPARATION OF RAVELED FABRIC STRIPS

In order to obtain other fabric strips of standard widths for soil burial tests, it is necessary to cut oversize specimens and then remove threads from both sides of the strips until the remaining warp is exactly one inch in width.

Figure 7
Down-draft ventilator system for use with laboratory padder
A—Removable dip tank
B—Down-draft enclosure for dip tank

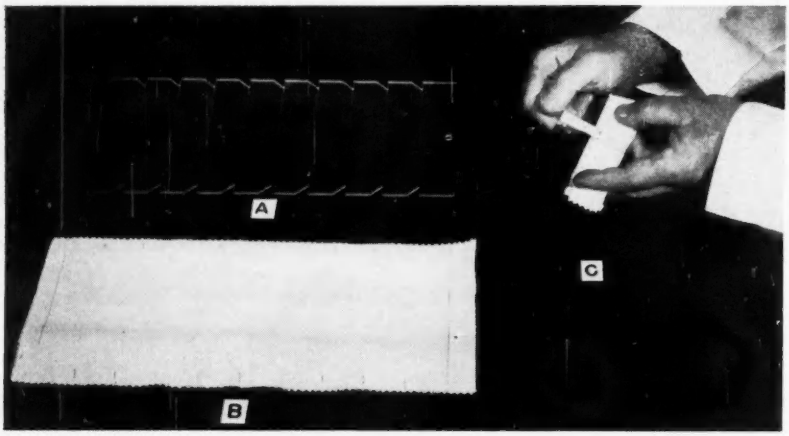


Figure 8
A—Plastic template for the marking of fabrics prior to cutting
B—A marked piece of fabric
C—A finger-clip rule for measuring the warp during raveling

A saving in time and material is accomplished by the use of a transparent plastic template (Fig 8-A) for marking the fabric prior to cutting. Nine parallel lines, 1½ inches apart, were scribed on a 6 x 15-inch sheet of plexiglass. Notches cut into the plastic at both ends of each line allows the marking of the fabric into ten 1½-inch strips preparatory to cutting (Fig 8-B).

During the raveling operation it is necessary to measure each strip a number of times before the desired width is reached. Picking up or transferring a ruler from hand to hand was so bothersome that a small finger-clip ruler (Fig 8-C) was devised to eliminate these repetitious motions. Merely extending the finger places the rule in the proper position for measuring. Making the device is simplicity in itself—just cement a narrow section cut from a plastic laboratory rule to a finger-clip obtained from a guitar pick. The presence of the device on either the fore or index finger does not interfere with the raveling.

VII. A RAPID METHOD FOR OUTLINING TEST SQUARES ON PAPER OR FABRICS[8]

[8]Designed by Lawrence M Ames, mycologist in charge, Fungus Control Section, U S Army Engineer Research and Development Laboratories.

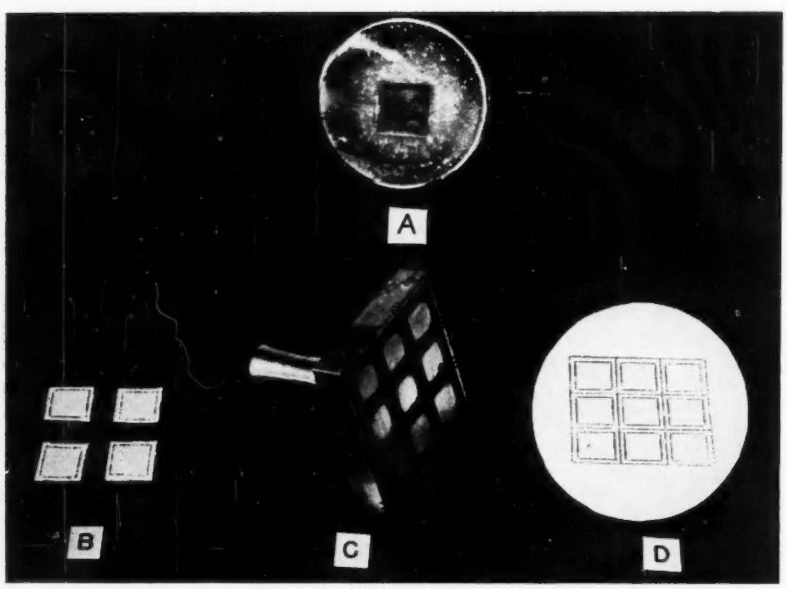


Figure 9
A rapid method for outlining test squares on paper or fabric
A—Test square in an inoculated Petri dish
B—Individual test squares cut to size from filter paper
C—The metal marking die
D—Marked filter paper stamped into test squares for cutting

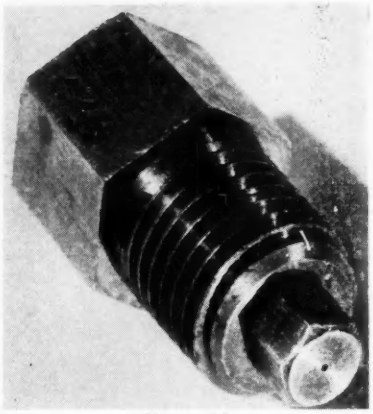


Figure 10
An atomizing-type spray nozzle for wetting soil-burial beds

One of the accepted laboratory methods of testing paint fungicides is to apply the test paint to filter papers, which in turn are cut into 1¼-inch test squares and then placed into Petri dishes for inoculation with fungus spores (Fig 9-A). The amount of fungus that grows past the guide lines (Fig 9-B) is the criterion used for evaluating the effectiveness of the fungicides. These guide lines are drawn one-eighth inch from each edge of the square.

The time required for preparing these squares was decreased considerably by the use of a metal marking die (Fig 9-C) for imprinting on each filter paper the lines (Fig 9-D) necessary for cutting and evaluating. A large rubber stamp pad is used for inking purposes. A less expensive but less durable die could be made by a rubber stamp manufacturer or by placing the printing rule in a suitable holder.

A rubber stamp also could be used on burlap or other loosely woven fabrics to outline the 4 x 6-inch sections needed for the grab method breaking-strength determination.

VIII. AN ATOMIZING-TYPE SPRAY NOZZLE FOR WETTING SOIL-BURIAL BEDS[9]

Raising the moisture content of soil-burial beds by wetting with available types of spray nozzles will often result in overwetting and lumping. Effective moistening can be obtained by using an atomizing-type of spray nozzle (Fig 10), which was made by drilling a 0.028-inch hole in a brass plug with a number seventy drill. The atomized mist from this device is sufficiently fine to give soil-burial beds the proper degree of wetting without the danger of subsequent lump formation.

[9]Suggested by Max P Whitford, engineer, Climatic Test Branch, U S Army Engineer Research and Development Laboratories.

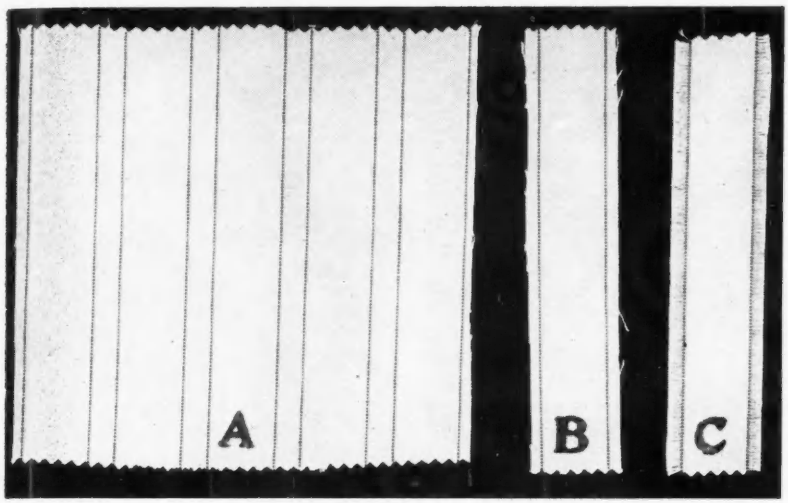


Figure 11
Stages in the preparation of 1-inch raveled test strips
A—A portion of the fabric showing the spacing of the colored warp yarns
B—An individual strip prior to raveling
C—A raveled strip

IX. A FABRIC DESIGNED FOR RAPID PREPARATION OF UNIFORMED RAVELED TEST STRIPS[10]

The use of one-inch raveled fabric test strips, for the determination of the tensile strength lost during soil burial, weathering, and pure culture tests, is one of the accepted methods employed by investigators to determine the microbiological degradation of fabrics impregnated with various types of fungitoxicants. The usual method of preparation is to remove warp yarns from oversize strips until the width is one inch across the remaining warp. This is a time-consuming task that requires care to ensure accuracy in raveling. A variation of plus or minus one yarn from the prescribed number required to give a one-inch warp can affect the mean breaking strength by an amount that is statistically significant.

Another serious objection to this method of preparation is that any raveling performed after exposure to weathering or fungicidal treatment may not take into consideration dimensional changes caused by shrinkage. A strip raveled to one inch after weathering may have a different thread count than the unexposed or untreated specimen of the same fabric. This difference in the thread count can be a significant factor when the breaking strength of one type of treatment is compared with that of another.

These disadvantages were overcome by the weaving of a special fabric that incorporated vat-dyed warp yarns at definite intervals to facilitate the cutting and raveling of test strips. The colored threads (Fig 11-A) are spaced at two intervals, a wide and a narrow spacing, which alternate with each other. The wide spacing, including the bounding yarns, is composed of a definite number of yarns as near to one inch as the weaving process will allow. The narrow spacing is approximately ¾ inch in width.

Cutting the fabric through the narrow interval will give strips that have a width of approximately 1¾ inches (Fig 11-B). Removing the warp threads up to, but not including the colored one, from each side of the strip, will leave a uniform number of threads in the warp direction (Fig 11-C). It is never necessary, during either the cutting or raveling, to measure the warp to assure replicate specimens. If raveling is necessary after a treatment or a weathering exposure, any dimensional change is self-compensatory; the raveling to the colored threads results in uniform strips having a definite number of yarns in the warp direction. Accurately raveled strips in any quantity can be prepared by unskilled personnel at a fairly high rate per hour without fatigue or eye strain. The accuracy of raveling can be rapidly checked by observing whether or not the last yarn on either side is a colored one. The preparation of raveled test strips can be increased at least 500% by the use of this specially woven fabric.

Plans are now being formulated by a number of defense agencies and other interested laboratories for the adoption of a standard fabric of this type. A portion of the adopted fabric after weaving will be treated with a fungicide that is selected by the cooperating agencies. These two types will be used as standard reference fabrics to correlate the test results of various laboratories and will serve as a medium for checking the biological activity of soil-burial beds, the effects of weathering, actinic degradation, and for other tests used in fungicidal evaluations.

[10]Shapiro, S, *Paint Varnish Prod* **46**, No. 10, 41, 93 (September 1956).

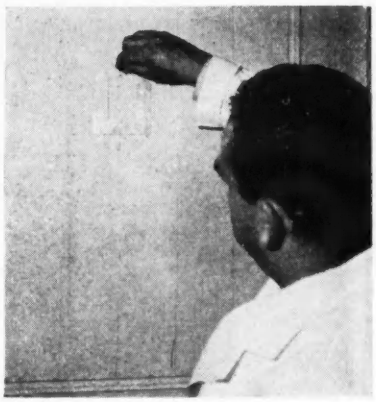


Figure 12
Using the template to evaluate the fungus growth on a door panel

X. A METHOD FOR EVALUATING FUNGUS GROWTH ON LARGE AREAS[11]

The inequalities of fungus growth on large tests areas make numerical evaluation of the effectiveness of paint fungicides difficult. This difficulty was overcome by devising a method which permits the evaluation of a small random section from which is obtained an average rating for the entire area. Basically, this method depends upon the use of a template (Fig 12) to divide a large area into a number of smaller ones. The arithmetical means obtained by evaluating a predetermined number of these small sections, which are selected without bias from the large test area, can be considered as being representative of the amount of fungus growth present on the entire surface.

A statistical analysis showed that a minimum of twenty-one random observations is necessary in order that a 0.5 difference between the means be significant at the 5% level. This figure (0.5) represents the difference between any two readings. The selection of the areas for estimating the fungus growth should be as unbiased as possible. Fig 13 shows a suggested arrangement for 22 observations on a rectangular area. This layout can be used as a guide for making in-

[11]Shapiro, S, *Paint Varnish Prod* **46**, No. 10, 41, 93, (September 1956).

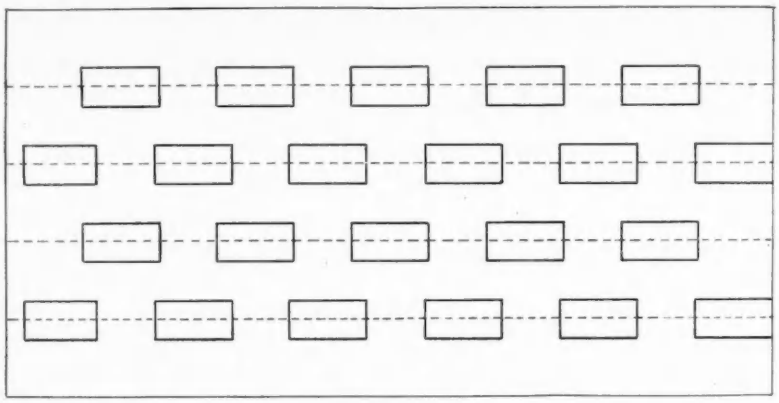


Figure 13
A suggested arrangement for 22 observations on a rectangular panel. Each observation represents 1 percent of the total area.

spections of panels on exposure sites.

For fairly accurate determinations, the size of the template opening should be governed by the area of the panels to be evaluated. If the template is so constructed that the opening is 1/10 of the width by 1/10 of the length of the test panel, the area exposed will be of a size convenient for evaluation. Each reading will then represent one percent of the total area. Should it be necessary to evaluate the fungus growth on an unusually large-size area, the template opening can be reduced to one half or one fourth of the suggested size. The area of the template opening, and the number of readings taken per panel can be modified to suit the specific needs of the observer. The important thing is that, regardless of the number of readings, they should be taken in such a manner that they are representative of the entire panel.

This method of estimating fungus growth is valid only when the growth is distributed over a fair amount of the surface area. It should not be used when the fungus growth is concentrated over a localized area while the rest of the panel may show slight or even no growth whatsoever (Fig 14).

This principal of reading small sections to evaluate a large area should be useful in other fields where comparative evaluations of surface changes are necessary. Estimation of corrosion, peeling of paint, blooming or blistering, are just a few of the possible applications.

Figure 14
When the fungus growth is localized, as shown on this paint panel, the results obtained by the use of the template method may be misleading

Abstracts

Cationic Dyes and Their Special Significance for Coloring Polyacrylonitrile Fibers

Dorset, B C M, *Textile Mfr* **83**, 518-22, Oct, 1957.

Quite recently, a new type of dye capable of very simple application to polyacrylonitrile fibers has been discovered; it is a type which requires no cuprous ions in the dyebath (like some other dyes), and in many instances requires much less drastic conditions of dyeing, so that normal dyeing procedures and equipment are sufficient. These new dyes are basic in character, but because the colored part of their molecule constitutes a cation, they are now more generally termed *cationic* dyes. Actually they are very similar chemically to the well-known basic dyes.

The author discusses the chemistry of these new dyes, termed Sevron by Du Pont and Deorlene by Ciba. In dyeing, where the dye is water-soluble, a simple aqueous solution is employed, but with dyes of limited water-solubility, a dispersing agent is added.

Some of the cationic dyes require a fairly strongly acid bath for dyeing, with an optimum pH of 4.0-5.5; others may be applied in a weakly acid or neutral dyebath. However, the author states that any of the dyes may be used in mixtures if the pH is maintained at 5.0 $\pm$ 0.5 by suitable buffers.

The affinity of the cationic dyes for Orlon 42 is so great that a retarding agent is required in the dyebath to assist in obtaining level dyeings.

In printing, the dyes are stirred with an organic acid, thickened with gum arabic, printed, dried, and steamed for 8 minutes.

Dyed on acrylic fibers, the cationic dyes are much faster than on cotton mordanted with tannin and antimony, or on wool and silk. The fastness of some of these dyes can be further improved by an aftertreatment at a temperature of 120-130°C.

According to the latest dyeing theory, there are present in the acrylic fibers a limited number of acid groups, which act as "sites" for the dyes.

Since the number of dye sites is limited, there is a limit to the amount of cationic dye which can be absorbed.

In dyeing Orlon-wool mixtures, cationic dyes can be combined with selected acid wool dyes, which leave the acrylic fiber undyed, while the cationic dyes do not stain the wool. In dyeing Orlon-cotton mixtures, cationic dyes are applied first, and direct dyes in a fresh bath.

In general, the cationic dyes can be stripped by oxidation or chlorination treatments.—WHC

Proceedings of the

American Association of Textile Chemists and Colorists

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February 10, 1958

1957 Intersectional Contest 3rd Prize Winner—

THE EFFECT OF IRON AND COPPER CONTAMINANTS ON COTTON DEGRADATION IN PEROXIDE BLEACHING*

SOUTHEASTERN SECTION

COMMITTEE

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An investigation of the degrading effects on certain heavy metals, their oxides, hydroxides, and salts, when present during peroxide bleaching of cotton yarns, has been conducted. Tests were made 1) in which the cotton yarns were impregnated with the contaminant before bleaching, and 2) in which the contaminants were placed in the bleach bath.

The effects of degradation were measured by means of skein breaks and cupriethylenediamine fluidity measurements.

Although it is probably not possible to draw definite conclusions from the data obtained so far, the following results have been noted for the samples studied:

1) The presence of metal contaminants is not necessarily a danger to cotton.

2) The form in which the metal is present as a contaminant is an important factor in its degrading effect on cotton.

3) Ferrous sulfate appears to be the greatest source of danger in peroxide bleaching of the materials tested.

INTRODUCTION

VERY little is known of the conditions under which metals, their oxides and their salts can cause damage to cotton in the bleaching process. It has long been known that damage occurs in the presence of iron, copper and a number of other metals under certain conditions, but that very often these metals may be present without causing any appreciable harm.

The work described was undertaken in order to throw some light on this subject. Our investigation is far from complete and many questions have arisen, but in view of the widespread interest in this topic, we have decided to present some of the results in the hope of obtaining some comments and suggestions for orientation of future work.

It has been considered likely that the variation in results found in the past was due to variation in the conditions of the metallic contaminant. The conditions considered most important for this investigation were 1) the concentration of the contaminant; 2) its state (whether metal, oxide, or salt); 3) whether the contanimant was in the bath or on the yarn; and 4) whether it was present free from or surrounded by oil (as it would have been had it come from bearing grease).

Two concentrations of bleach baths were investigated; one at normal bleaching strength, and another appreciably stronger. The latter bath showed definite damage to the cotton without any contaminant, and thus certain effects could be seen which were obscured in the normal bleach bath. It is believed that further investigation of these effects will throw additional light on the problem.

It has been noted by a number of investigators that certain impurities, such as calcium salts, act as a peroxide stabilizer in very minute quantities. In order to minimize variations from this source, we used only deionized water for making up solutions. Further, the yarn was scoured before entering the bleach bath, in order to remove most of its natural impurities, many of which may act as stabilizers.

The scoured yarns, after bleaching with the various contaminants, were tested for degradation by making skein breaks and cupriethylenediamine fluidities. It was noted that, in the cases of the extra strong bleach baths, that the fluidity results did not necessarily correlate with those of the breaking strength tests. We assume that this can be related to the fact that, in most cases, the contaminant was a solid, and more than likely gave a highly local degradation, which could affect the breaking strength much more than the fluidity. For instance, a yarn with two or three very tiny, very weak spots would have a low breaking strength, even though most of the yarn was still in good condition and would show high fluidities. It is certainly true that, in most of the cases investigated, the fluidity loss on contamination was comparatively less than the breaking strength loss, although this was not invariably so.

In the presence of the contaminants, we must consider two things: 1) possible damage to the cellulose, and 2) decomposition of the peroxide solution itself. It is generally considered that the cotton is damaged by the formation of oxycellulose during the bleaching operation. The contaminants under study in this work seemed to have some catalytic effect in the formation of the oxycellulose. It is believed that several effects occur: oxycellulose formation by catalysts in solution, oxycellulose formation by solid catalysts in contact with the cotton, and increase in oxycellulose formation indirectly as a result of highly localized overheating in the presence of a particle of contaminant which acts primarily as a peroxide decomposer. A similar effect may also be the result of local high concen-

*Presented by J L. Taylor on November 15, 1957 at the 36th National Convention, Hotel Statler, Boston, Mass.

trations of active oxygen, which could speed up the formation of oxycellulose.

Nicoll and Smith (14) made a study of the catalytic decomposition of hydrogen peroxide, in which they showed that this decomposition was catalyzed by compounds of copper, iron and other materials; and that the peroxide was stabilized by the presence of calcium and magnesium ions in the solution.

These investigators and others have shown that both copper and iron can decompose peroxide, both as homogenous and as heterogenous catalysts. Ferrous ions are strong catalysts, and it is noted that the rate of decomposition decreases when the ferrous iron has been oxidized to ferric. Strangely enough there is evidence that the ferric ion acts as a stabilizer at low concentrations, while it has a decomposing effect at high concentrations. This seems to be due to the fact that the ferric ion may be solubilized under certain conditions; but when these limits are exceeded, ferric hydroxide forms, which acts as a strong decomposition catalyst. Cupric hydroxide is less powerful, and copper metal, although slightly effective, is less of a catalyst than the hydroxide. The effect of copper seems strongest when it can alternate between the cuprous and cupric ions in the solution.

EXPERIMENTAL PROCEDURE

The yarns chosen for this test were number 26/1 cotton. They were conditioned at 65% RH and 70° F. To further standardize, 25 breaks were made on each cone, and only those cones showing a breaking strength of 0.72± 0.02 lbs were used. Five-gram skeins were used in the study throughout.

The skeins were first scoured in a six-to-one bath, using 4% of caustic soda based on the yarn weight. Deionized water was used here and in all further tests. The scouring was carried out for four hours at the boil, followed by thorough rinsing and air drying.

The metallic substances used in the contaminations were: copper metal, iron metal, cuprous oxide, ferric oxide, cupric hydroxide, ferric hydroxide, cupric sulfate, and ferrous sulfate. The contaminating metallic compounds were introduced into the bleaching system by addition to the bleach bath or by saturation into the yarn prior to bleaching.

The iron and copper substances were utilized as contaminants in aqueous and oil media. Each of the forms of these metals was used in an aqueous medium but only the metal powders and metallic oxides were introduced in an oil medium.

In the contamination of the bleach bath, the yarns were first wet out in the bleach solution for five minutes, then removed while the contaminant was introduced, after which they were returned to the bath.

CONTAMINATION OF THE YARN———Six five-gram skeins were placed in each of the glass jars containing a contaminant solution or dispersion. The jars were then sealed and placed on the rotor of the Launder-Ometer. The motor was started and the solutions were agitated by this means for 15 minutes.

After agitation, the skeins were passed through the squeeze rolls of a laboratory-size padder. The squeeze-roll pressure was adjusted so that a liquor pickup of 100 per cent was obtained on the skeins. This pressure was approximately 10 pounds.

The contaminated skeins were then immediately placed into the standard bleach bath and treated for the predetermined time interval.

PREPARATION OF THE BLEACH BATH———The high-strength bleach bath was made up with 6% sodium silicate, 1% sodium hydroxide, and 7% of a 30% hydrogen peroxide solution. These percentages were based on the bath weight.

The caustic soda was added to approximately 500-ml of deionized water in a volumetric flask, followed by addition of the sodium silicate and finally the hydrogen peroxide. The solution was then diluted to the one liter mark.

For the normal concentration bleach bath, one-fourth the above quantities were used. The pH was adjusted to 11.5 with sulfuric acid before use.

Before bleaching, we tested the bath for peroxide concentration and brought it up to strength where necessary.

Six five-gram skeins were bleached in each bath, using a six-to-one liquor ratio. The bleaching was carried out in one-liter beakers. A 600-ml beaker set in this bath kept the skeins below the liquor level and minimized evaporation. Temperature was raised to 190° in 20 minutes, and bleaching proceeded for two and a half hours, with stirring every fifteen minutes. After this, the skeins were removed, rinsed, air dried and conditioned for 48 hours.

Five of the skeins were broken on a Scott Model J tester, and the other was used for cupriethylenediamine fluidity tests.

RESULTS

The results are summarized in Tables I-X and figures 1-8.

TABLE I

Mean breaking strength & fluidities of skeins uncontaminated by metallic substances (Yarns used in high-strength bleach bath)

Process history of skeins	Breaking strength (lbs)	Fluidity (Rhes)
Scoured, unbleached	234.0	3.3
Bleached (uncontaminated)	83.0	24.2
Bleached with oil in bath	84.2	18.4
Bleached with oil on yarn	82.8	21.0

TABLE II

Mean breaking strength & fluidities of skeins uncontaminated by metallic substances (Yarns used in normal bleach bath)

Process history of skeins	Breaking strength (lbs)	Fluidity (Rhes)
Scoured, unbleached	255.6	2.0
Bleached, uncontaminated	244.4	4.3

TABLE III

Mean breaking strength in pounds of skeins bleached in a bath contaminated with copper

Metallic state	10^{-7} M*	10^{-6} M	10^{-5} M	10^{-4} M	10^{-3} M
Metal in aqueous medium	—	—	55.8	27.2	75.0
Metal in oil medium	—	—	92.8	91.6	105.6
Oxide in aqueous medium	—	—	75.4	66.2	31.0
Oxide in oil medium	—	—	81.6	91.2	26.6
Hydroxide in aqueous medium	115.2	109.4	90.0	84.8	124.0
Sulfate in aqueous medium	112.2	90.8	99.2	136.6	228.8

*Molar concentration.

TABLE IV

Fluidity in Rhes of skeins bleached in a bath contaminated with copper

Metallic state	10^{-7} M	10^{-6} M	10^{-5} M	10^{-4} M	10^{-3} M
Metal in aqueous medium	—	—	9.4	18.2	13.6
Metal in oil medium	—	—	24.0	17.0	20.1
Oxide in aqueous medium	—	—	23.2	24.0	18.0
Oxide in oil medium	—	—	19.4	20.0	19.8
Hydroxide in aqueous medium	15.9	17.0	16.4	17.0	11.4
Sulfate in aqueous medium	16.3	15.1	18.0	14.3	8.0

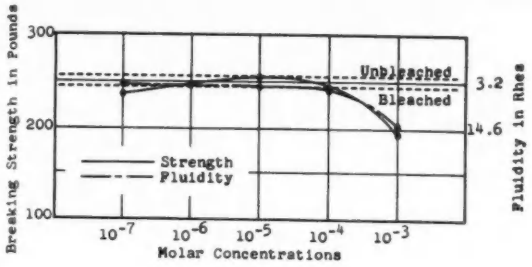

Figure 1
Breaking strength and fluidity of skeins bleached in 1.75% hydrogen peroxide (ferrous sulfate contaminant in the bleach bath)

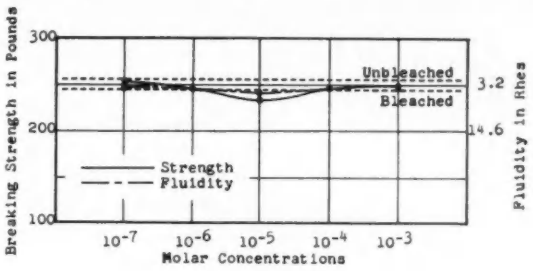

Figure 3
Breaking strength and fluidity of skeins bleached in 1.75% hydrogen peroxide (cupric sulfate contaminant in the bleach bath)

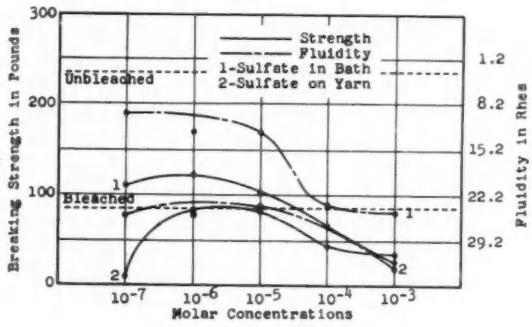

Figure 2
Breaking strength and fluidity of bleached skeins (ferrous sulfate contamination from an aqueous medium)

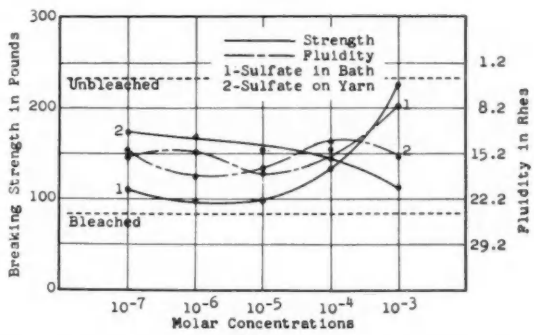

Figure 4
Breaking strength and fluidity of bleached skeins (cupric sulfate contamination from an aqueous medium)

DISCUSSION OF RESULTS

The results found in the strong bleach baths were so varied that, without further work, it is extremely difficult to attempt to draw any conclusions over most of the range. In many cases, there was less deterioration of the goods in the presence of the contaminant than without it. It seems to us highly important to determine whether this is a result of a stabilizing effect of the contaminant, or simply that the contaminant has decomposed the peroxide faster, giving it less opportunity to damage the cotton.

The only unequivocal results show that there was damage to the yarns by copper metal, cuprous oxide, ferric hydroxide and ferrous sulfate at concentrations of 10^{-3} molar. This is equivalent to about 60 ppm of the metals. In a solution, this would seem to be quite a high concentration, but it must be remembered that, often, the local damage to cotton may occur by local contamination of solid particles, which would give the equivalent of a quite high local concentration.

In the case of copper, the fluidity determinations indicated a protection of the cotton, while the breaking strength determinations showed a weakening. In many other cases, during the course of this investigation, we found the same phenomenon. Obviously the deterioration of the cotton, as far as strength is concerned, cannot be estimated by fluidity values alone.

On the graph shown in Fig 1 we see the effect of ferrous sulfate on the yarns. Curve 1 shows the effect when the contaminant is in the bath, curve 2 when it has been applied to the yarns before immersing in the bath. The top line shows the strength and fluidity of the unbleached yarn, while the bottom line shows the strength and fluidity of the yarn when bleached without contaminant in a bath of 1.75% peroxide.

We see that, at 10^{-3} mols, there is a definite weakening of the yarns, about 20% loss in strength and a corresponding increase in fluidity. At 10^{-7}, there may be a loss, or this may be experimental error. In between, the figures are probably all within experimental error, showing practically no damage.

If we now spread the curves out by using a peroxide concentration of of 6% instead of 1.75%, we find that the curve actually is of the shape indicated at the lower concentration (Fig 2). With the contaminant applied to the yarn, both the breaking strength curves and the fluidity show a maximum at 10^{-6}, with appreciable damage at 10^{-7} (about 6 parts per billion). This high sensitivity to ferrous sulfate was unexpected, particularly to the extent that the breaking strength was lost. The question again arises: At the intermediate concentrations, what happens? Is the iron protecting the yarn, stabilizing the peroxide, or decomposing it so fast that it has less opportunity to damage the yarn?

It is hoped that further work will clarify these points.

Going on to the contamination caused by cupric sulfate (Fig 3), there seems to be no appreciable damage except for a slight dip in the middle concentration. Is this a real point, or experimental error?

Again spreading the curves by use of a stronger bleach bath (Fig 4), we see that there does seem to be a region of maximum fiber damage when the cupric sulfate is in the bleach bath. The damage is less with either less or more contaminant—with a high percentage of contaminant, we actually find very little damage. Perhaps the peroxide has been destroyed. (We intend to check this). But a different question arises here: At *all* concentrations, there is less damage

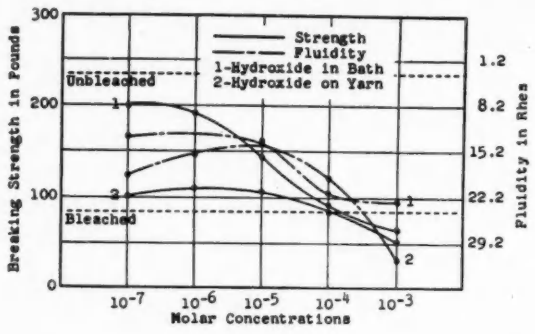

Figure 5
Breaking strength and fluidity of bleached skeins (ferric hydroxide contamination from an aqueous medium)

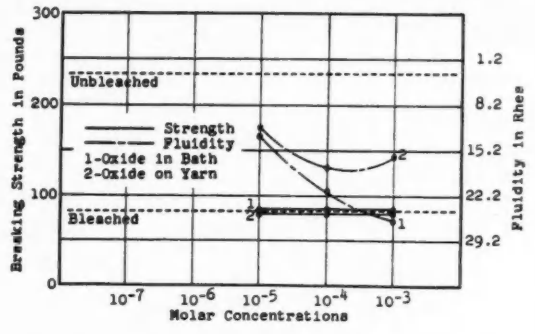

Figure 7
Breaking strength and fluidity of bleached skeins (ferric oxide contamination from an oil medium)

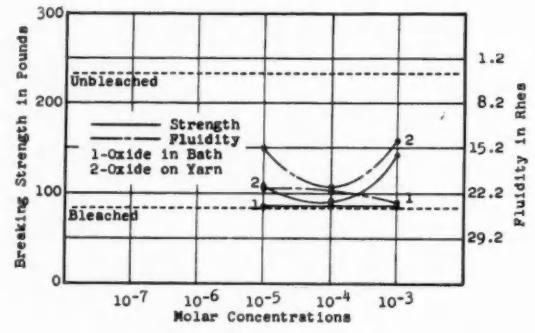

Figure 6
Breaking strength and fluidity of bleached skeins (ferric oxide contamination from an aqueous medium)

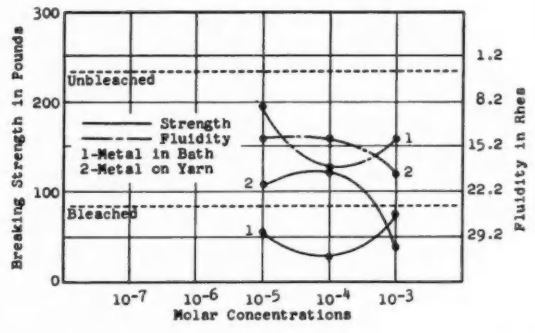

Figure 8
Breaking strength and fluidity of bleached skeins (copper metal contamination from an aqueous medium)

TABLE V

Mean breaking strength in pounds of skeins contaminated with copper prior to bleaching

Metallic state	10^{-7} M	10^{-6} M	10^{-5} M	10^{-4} M	10^{-3} M
Metal in aqueous medium	—	—	107.3	120.0	36.4
Metal in oil medium	—	—	9.8	73.8	85.4
Oxide in aqueous medium	—	—	101.6	197.8	28.2
Oxide in oil medium	—	—	69.6	83.8	106.2
Hydroxide in aqueous medium	65.4	115.0	160.4	108.0	101.4
Sulfate in aqueous medium	172.8	167.6	157.0	145.2	115.2

TABLE VI

Fluidity in Rhes of skeins contaminated with copper prior to bleaching

Metallic state	10^{-7} M	10^{-6} M	10^{-5} M	10^{-4} M	10^{-3} M
Metal in aqueous medium	—	—	13.2	13.3	19.7
Metal in oil medium	—	—	17.0	23.0	20.0
Oxide in aqueous medium	—	—	13.0	8.0	22.4
Oxide in oil medium	—	—	22.9	17.0	17.0
Hydroxide in aqueous medium	20.2	20.0	23.0	25.0	21.0
Sulfate in aqueous medium	14.4	18.7	16.5	12.9	16.0

TABLE VII

Mean breaking strength in pounds of skeins bleached in a bath contaminated with iron

Metallic state	10^{-7} M	10^{-6} M	10^{-5} M	10^{-4} M	10^{-3} M
Metal in aqueous medium	—	—	63.4	121.4	79.8
Metal in oil medium	—	—	98.6	107.0	98.8
Oxide in aqueous medium	—	—	85.0	83.8	82.4
Oxide in oil medium	—	—	84.0	83.0	82.4
Hydroxide in aqueous medium	200.0	192.4	142.0	92.2	68.4
Sulfate in aqueous medium	118.2	123.6	104.6	62.8	26.8

TABLE VIII

Fluidity in Rhes of skeins bleaches in a bath contaminated with iron

Metallic state	10^{-7} M	10^{-6} M	10^{-5} M	10^{-4} M	10^{-3} M
Metal in aqueous medium	—	—	12.9	20.6	12.1
Metal in oil medium	—	—	20.0	22.1	18.3
Oxide in aqueous medium	—	—	21.0	22.0	24.0
Oxide in oil medium	—	—	13.4	21.6	26.0
Hydroxide in aqueous medium	12.8	16.0	13.1	21.3	22.7
Sulfate in aqueous medium	10.0	13.1	13.4	23.8	25.3

TABLE IX

Mean breaking strength in pounds of skeins contaminated with iron prior to bleaching

Metallic state	10^{-7} M	10^{-6} M	10^{-5} M	10^{-4} M	10^{-3} M
Metal in aqueous medium	—	—	97.8	128.7	127.2
Metal in oil medium	—	—	66.7	15.2	110.0
Oxide in aqueous medium	—	—	109.2	91.2	137.0
Oxide in oil medium	—	—	83.2	81.8	81.0
Hydroxide in aqueous medium	103.4	117.8	107.4	84.2	52.8
Sulfate in aqueous medium	10.2	83.4	79.6	38.4	34.2

TABLE X

Fluidity in Rhes of skeins contaminated with iron prior to bleaching

Metallic state	10^{-7} M	10^{-6} M	10^{-5} M	10^{-4} M	10^{-3} M
Metal in aqueous medium	—	—	17.0	14.1	14.8
Metal in oil medium	—	—	18.0	25.0	14.0
Oxide in aqueous medium	—	—	15.1	21.0	13.0
Oxide in oil medium	—	—	11.4	17.1	16.0
Hydroxide in aqueous medium	19.0	16.0	14.0	19.4	32.0
Sulfate in aqueous medium	26.2	26.0	24.0	27.2	34.0

than with no contaminant. Is there actually protection of the cotton by the copper salt? Comparison with the curve obtained when the contaminant is applied to the yarn only seems to confuse the issue. Why should the yarn show less deterioration at 10^{-7} cupric sulfate than it does when the contaminant is in the bath? Does this prove a positive protection here? Both show less damage than the pure bleach bath.

Figures 5-8 show that the other experiments also brought out questions which could not be readily answered.

In the case of ferric hydroxide (Fig 5), we find very definite yarn damage at 10^{-3}. Below this, the yarn is not damaged. The least damage occurs when the hydroxide is in the bath—probably the bath is destroyed before the yarn can be damaged.

Ferric oxide does not seem to damage the yarn, any more than the bleach alone (Fig 6). Perhaps iron rust is not the villain we thought when we first started looking. A similar curve is obtained if the ferric oxide is in oil, as it would be in bearing-oil spots. (Fig 7).

Fig 8 shows the sort of result which disturbs us. In the case of copper metal, we have damage at a concentration of 10^{-3}, but why should there be damage at lower concentrations when the contamination is in the bath, and not when it is on the yarn?

SUMMARY

In summary, we find that the presence of metal contaminant is not necessarily a danger to the cotton. Iron, for instance, can be present in quite high concentrations if it is present as ferric oxide, and it is probably fairly safe under some other conditions. The ferrous sulfate seems to be the greatest source of danger, even at minute concentrations of 6 parts per billion. At the same time many contaminants, even including the dangerous ferrous sulfate, do not cause trouble at intermediate concentrations and may possibly even be protecting the cotton.

It is intended to follow this work further by determining whether some of these anomalies in the curves are due to loss of peroxide or to protection of the cotton. Some of the curves will be extended to determine the actual shape, particularly at the lower levels. We are particularly interested in determining which compounds or conditions of the metals are the most dangerous or least dangerous, so that the finisher may be in a position to take steps to modify properly his operations in order to minimize the danger whenever these contaminants are present.

ACKNOWLEDGMENTS

We wish to express our appreciation to all those whose help made this report possible, and in particular to Francis X Nerney of Becco Chemical Division; Norman Arnold of Du Pont; Howard Waddle and the laboratories of West Point Manufacturing Company (who did the fluidity checks); and Stuart D Snyder, now with the Textile Fibers Department of Du Pont (who did the laboratory work under the supervision of J L Taylor, as work toward his M S thesis at Georgia Tech).

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AATCC Calendar

COUNCIL
May 23 (Philadelphia, Pa); Sept 19 (Charlotte, NC)

NATIONAL CONVENTIONS
Oct 30-Nov 1, 1958 (Hotel Conrad Hilton, Chicago); Oct 8-10, 1959 (Sheraton Park and Shoreham Hotels, Washington, DC); Oct 6-8, 1960 (Sheraton Hotel, Philadelphia, Pa); September 28-30, 1961 (Buffalo, NY)

HUDSON-MOHAWK SECTION
Jan 24, Mar 28 (Jack's Restaurant, Albany, NY); May 16 (Ladies Night, Chelsea House, Tribes Hill, NY); June 20 (Annual Outing, Antler's Country Club, Ft Johnson, NY)

METROPOLITAN SECTION
April 11 (New Jersey area)

MID-WEST SECTION
Feb 15 (Hotel Bismarck, Chicago, Ill); April 19 (Netherland Hilton Hotel, Cincinnati, O); June 13-14 (Outing—Browns Lake Resort, Burlington, Wis)

NIAGARA FRONTIER SECTION
Feb 21 (Buffalo); Apr 11 (Joint meeting)

NORTHERN NEW ENGLAND SECTION
Mar 28 (Commander Hotel, Cambridge, Mass); May 9 (Lowell Technological Institute, Lowell, Mass); Sept 12 (Outing—Wachusett Country Club, West Boylston, Mass); Oct 17 (QM Research & Development Ctr, Natick, Mass); Dec 5 (Hotel Vendome, Boston, Mass); Jan 16 (Colonial Club, Lynnfield, Mass)

PIEDMONT SECTION
Apr 25-26 (Washington Duke Hotel, Durham, NC); June 6-8 (Outing—Grove Park Inn, Asheville, NC); Sept 19-20 (Hotel Charlotte, Charlotte, NC)

RHODE ISLAND SECTION
Mar 21 (Providence Engineering Society, Providence, RI); Apr 25 (Students Night—Bradford Durfee College of Technology, Fall River, Mass); June 13 (25th Annual Outing—Wannamoisett Country Club); Sept 26 (Management Night—Warwick Country Club); Oct 23 (Providence Engineering Society); Dec 4 (Annual Meeting—Johnson's Hummocks Grille, Providence)

SOUTH CENTRAL SECTION
Mar 29 (Hotel Patten, Chattanooga, Tenn); May 30-31 (Summer outing—Hotel Greystone, Gatlinburg, Tenn); Sept 13 (Hotel Patten, Chattanooga, Tenn)

SOUTHEASTERN SECTION
Feb 15 (The General Forrest Hotel, Rome, Ga); Apr 19 (Alabama Polytechnic Institute, Auburn, Ala); June 6-7 (Summer outing—Radium Springs Lodge, Radium Springs, Ga); Sept 13 (Columbus Country Club, Columbus, Ga); Dec 6 (Atlanta, Ga)

1957 Convention—

DYEING OF ZEFRAN AND BLENDS CONTAINING ZEFRAN*

A S MESSER
The Dow Chemical Co
Western Division
Pittsburg, Calif

Zefran is a nitrile alloy fiber. The ease as well as the versatility in dyeing is seen in the ability of Zefran to be dyed with the dyes for cellulosic fibers, ie, vats, soluble vats, naphthols, sulfurs and aftertreated directs, as well as with the neutral premetalized dyes for wool. The procedures for application closely approximate those used for the natural fibers; commercial runs as well as rate studies bear this out. For the most part, unions of Zefran with the cellulosic fibers or wool are carried out as a one-bath operation in normal dyeing cycles; through dye selection, temperature regulation and reserving agent. Continuous dyeing and printing may be carried out wth Zefran.

INTRODUCTION

ZEFRAN, Dow Chemical Company's first synthetic fiber, is to be manufactured in commercial quantities at Lee Hall, Virginia. It is a white fiber and is referred to as a nitrile alloy. This structure enables Zefran to be readily dyeable with such outstanding dyestuff classes as vat, soluble vat, sulfur, naphthol, aftertreated direct and neutral premetalized. The term "readily dyeable" deserves an explanation, and for the present may be interpreted as encompassing those conditions of dyeing associated to a great degree with those of the natural fibers.

In today's textile market a synthetic fiber finds itself in a myriad of blends. Consequently, the dyeability of Zefran in blends with the natural fibers, which is of utmost importance, is to be taken up subsequently. Rate of dyeing studies were carried out on Zefran and blends containing Zefran. The importance of the latter lies in the fact that, in the majority of cases, blends containing Zefran are dyed with a single class of dyestuffs, depending upon the blend composition and end use. The ability to dye blends of Zefran and wool and blends of Zefran and cellulosic fibers in one dyebath with one of several dyestuff classes is certainly a new and challenging experience for a synthetic fiber. The data presented is concerned principally with the various factors which influence the dyeing of Zefran and blends containing Zefran. A complete listing of recommended dyestuffs with fastness properties is also available to the trade through The Dow Chemical Co.

BLENDS OF ZEFRAN AND WOOL

Neutral premetalized dyestuffs have good all-around fastness properties on Zefran. As in the case of wool, a few of the brighter members of this class (not true metal complexes) possess only moderate fastness properties. There are chemical differences between manufacturers' types, though all are referred to as neutral premetalized dyestuffs. These differences show up at times in the light stability on Zefran.

This class of dyestuffs is finding more and more acceptability in the dyeing of wool. The short dyeing cycle, favorable pH requirements and good fastness properties account for this increase in popularity. In some areas of piece goods dyeing, eg, worsted gabardines, this class has not been very effective as a result of poor coverage of warp streakiness. In blends with Zefran, this latter disadvantage has good opportunity to be considerably reduced. Figures 1, 2 and 3 compare the migration under various dyeing conditions of Zefran and wool. This is a standard test for ascertaining leveling tendency and is carried out by placing dyed fiber in with undyed and running for given lengths of time under various conditions. The percentage of dye transferred was determined spectrophotometrically.

The greater leveling power of this class of dyestuffs on Zefran is quite apparent. The blues in light shades do have a tendency towards unevenness; in no circumstances should they be run without a leveling agent. From this work we also see the advantage of using a leveling agent (Avalon 1W in this case). Good level dyeings on Zefran have been experienced in commercial trials.

In the breakdown of dyeing blends of Zefran and wool, let us assume throughout that the blend composition is 50/50. Let us next consider the dyeing of light shades; Figure 4 demonstrates the rates of dyeing for Zefran and wool when dyed together with 0.2% of a neutral premetalized olive under normal dyeing conditions. There is seen a disproportionate distribution of dye between the two fibers. These are typical distribution curves with a blend of Zefran and wool with neutral premetalized dyestuffs in light shades.

In Figure 5 we see how this distribution can change with the nature of the chemicals in the dyebath when introduced at the start of the dyeing. Though with acetic acid it is possible to equalize the two fibers, this dyeing system may prove risky in light shades because of the higher strike. In addition, there is a loss of control of the system as shading of both fibers then becomes a problem. The more judicious plan is to dye with 1-2% ammonium sulfate and a leveling agent, whereupon the Zefran is dyed with a very small percentage going on the wool. To fill in the wool, selected dyestuffs of the milling class are used, eg, Acid Blue 80 (*CI* 61585), Acid Blue 143, Acid Violet 48, Acid Violet 34 (*CI* 61710), Acid Red 145, Cibalan Yellow FGL. Under these conditions, the Cibalan Yellow FGL stains the Zefran to a slightly greater degree than do the others.

The application of these milling colors for wool is carried out by proceeding to dye the Zefran first with the neutral premetalized dyestuffs. Figure 6 demonstrates the typical role Zefran plays in the presence of wool with a milling color. A typical procedure is to start at 105°F with one to two percent ammonium sulfate, one-half to one percent leveling agent, and neutral premetalized dyestuff.

*Presented November 16, 1957 during the 36th National Convention, AATCC, at the Hotel Statler, Boston, Mass.
Note: Trademarks are identified at the end of this article.

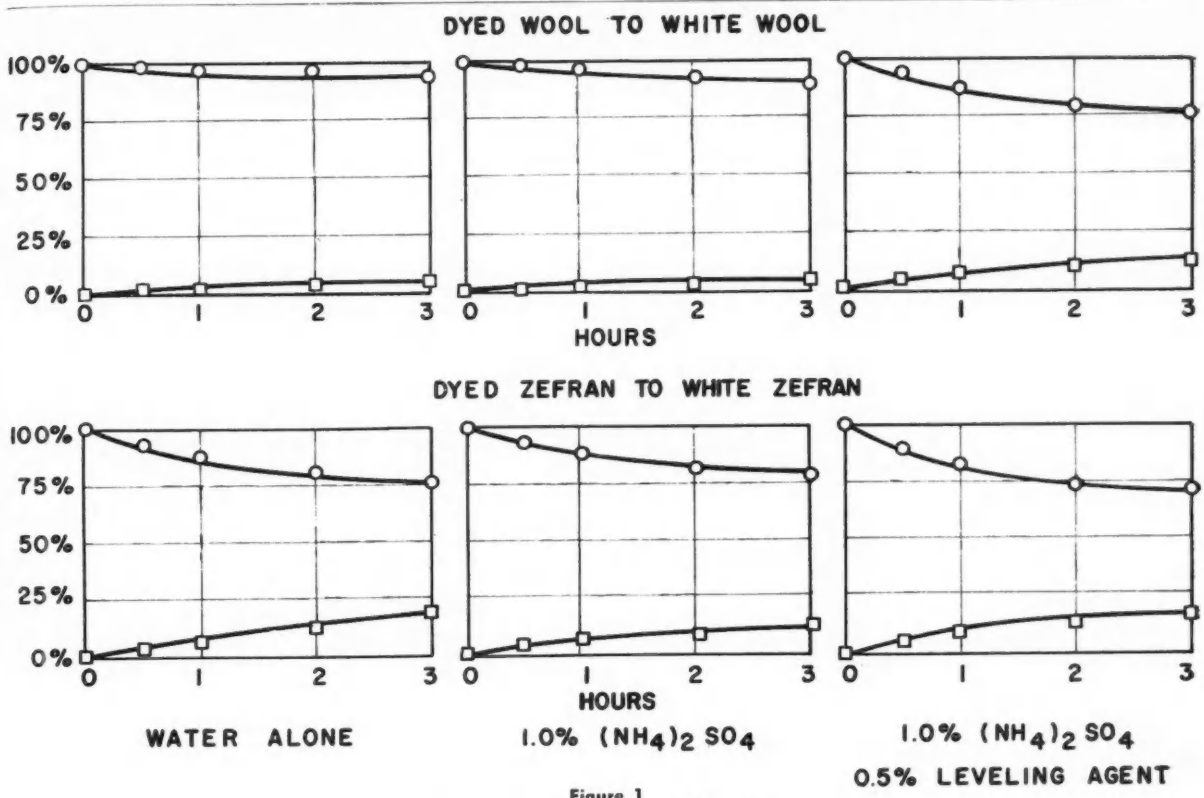


Figure 1
Migration—0.5% Acid Yellow 116

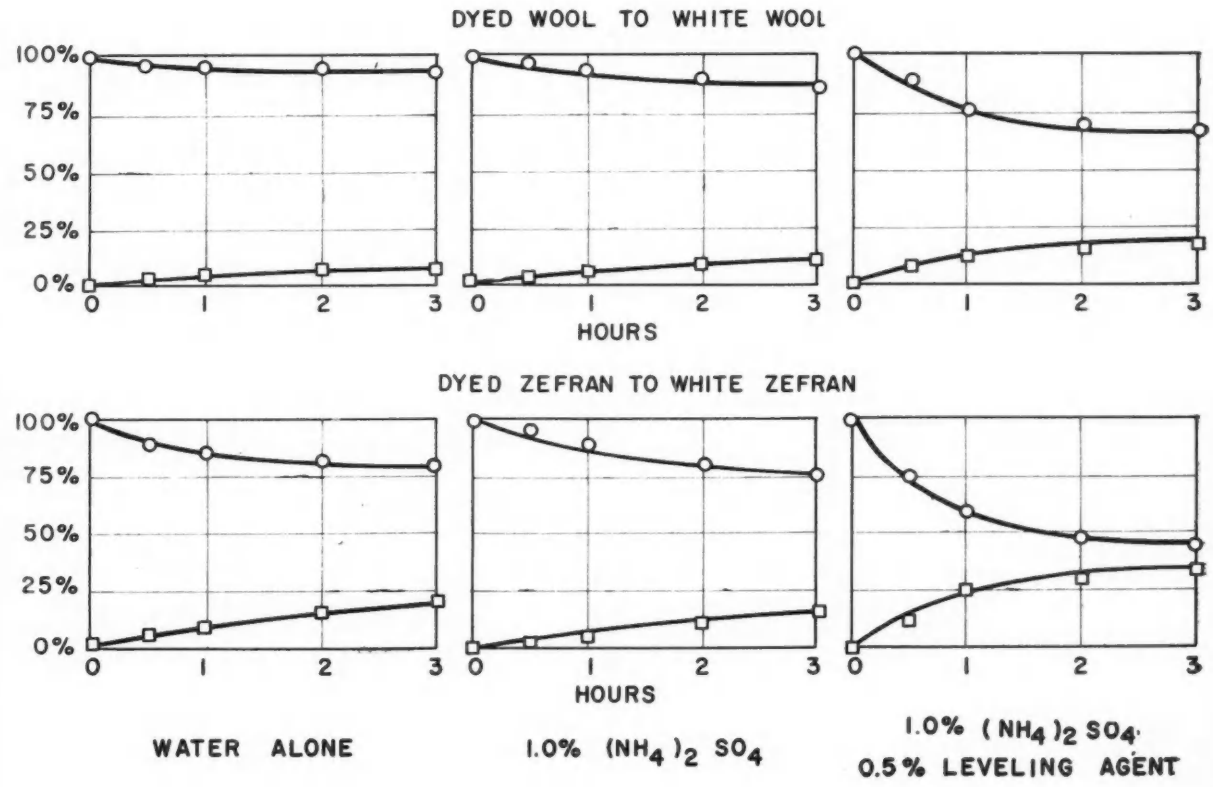


Figure 2
Migration—0.5% Acid Red 209

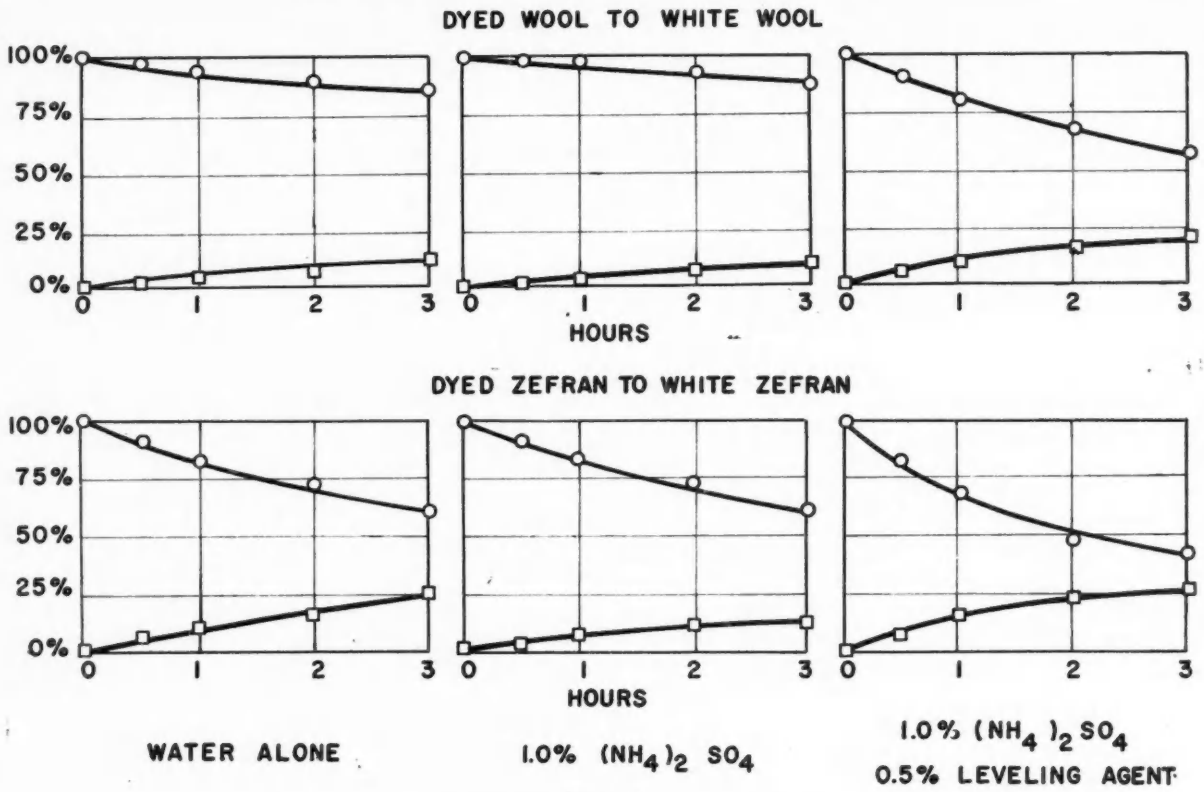


Figure ,3
Migration—0.5% neutral premetalized blue

After heating to 205°F in 45 minutes and running for 30 minutes at this temperature, the bath is cooled to 170°F; then the milling colors for the wool are added, the temperature increased to 205°F and kept constant for 45 minutes. With practice (after the degree of dyeing on the wool from the neutral premetalized dyestuff is known) the milling dyestuffs may be added together with the neutral premetalized dyestuffs at the start. The behavior of milling dyestuffs in the dyeing system for Zefran and wool is both interesting and most serviceable, as a leveling action takes place, which reduces the risk normally expected with these dyestuffs. Here we find partial adsorption onto the Zefran, followed by desorption, then adsorption onto the wool. The very slight stain remaining on the Zefran has not been found to be detrimental to the overall fastness properties or to the control of shading. The transfer takes place in the order of normal dyeing times and is most rapid at the maximum dyeing temperature. A safe practice is to wait 30 minutes between feeds.

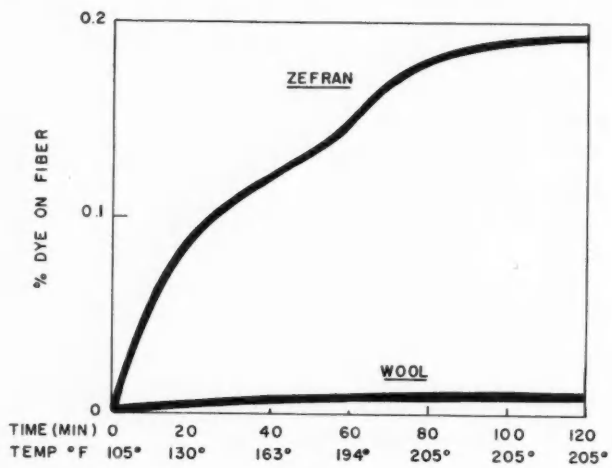


Figure 4
0.2% Neutral Premetalized Olive
50/50 blend of Zefran and wool; 1% $(NH_4)_2SO_4$; 2% leveling agent; 30/1

For the production of dark shades, a typical rate of dyeing curve is seen in Figure 7. Again, both fibers were dyed in one dyebath. The shape of the two curves and the final yield approximate one another, with a good union as a result.

Figure 8 demonstrates the effects of various chemicals in such a dyeing. A lowering of the pH with acetic acid promotes a greater build-up on the wool. Consequently, 5% ammonium sulfate is recommended for the dyeing of medium and dark shades for a blend of Zefran and wool. When shading of the wool at this depth cannot be carried out with the neutral premetalized dyestuffs, it may be accomplished with selected milling

colors. For bright shades, such as reds, royals and greens, when using the brighter components of the neutral premetalized dyestuff class, dyeing at 205°F favors the wool; consequently, it is necessary to dye the Zefran in a cooling bath. At 180°F, for example, a good union results between Zefran and wool, but at this temperature the wool appears skittery; consequently, it must be dyed at 205°F. In some cases, for example in dyeing a bright red, it is necessary to use a milling red normally used for wool, together with a bright neutral premetalized red. (The best we have found so far is Cibalan Brilliant Red BL). At 205°F the milling red and part of the neutral premetalized red dye the wool. As the bath is cooled to 180°F, the Zefran is dyed with the neutral premetalized red.

In the event that carbonizing precedes dyeing, thorough and uniform neutralization should be carried out before the application of dye.

Whenever possible, eg, in the production of greys, the use of the neutral premetalized olives is recommended in place of the blues, as their light stability is superior.

BLENDS OF ZEFRAN AND CELLULOSIC FIBERS

NAPHTHOLS——The recommendation for the utilization of naphthols for Zefran and blends of Zefran and cellulosic fibers parallels their use for the cellulosic fiber itself; namely, to supplement the shade requirements for fast colors not obtainable with vat dyestuffs. There are four distinct differences in the application of naphthols to Zefran and to the cellulosics:

1) Yields on Zefran increase with temperature of application, with 176°F as a maximum.

2) The nonsubstantive members of the naphthol AS series, as well as the other substantive naphthol types for the cellulosics, show exhaustion of 50% or more at 20:1 on Zefran.

3) The minimum concentration of sodium hydroxide consistent with solubility and stability requirements is recommended for Zefran. The alkali necessary varies inversely with temperature of application.

4) Full shade development is attained by means of cold, followed by warm, coupling.

The dyeing of blends of Zefran and cellulosic fibers with naphthols is based primarily on the utilization of one naphthol (or combination for shading) in one bath for both

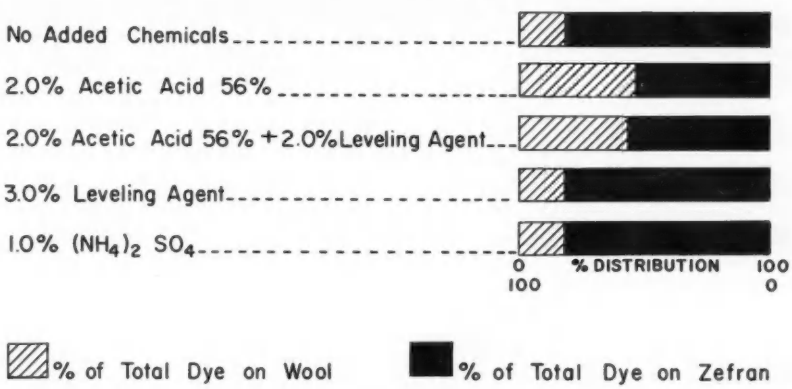


Figure 5
0.2% Neutral Premetalized Olive
Effect of auxiliary chemicals on dye distribution between wool and Zefran
30/1; 208°F; one hour running time

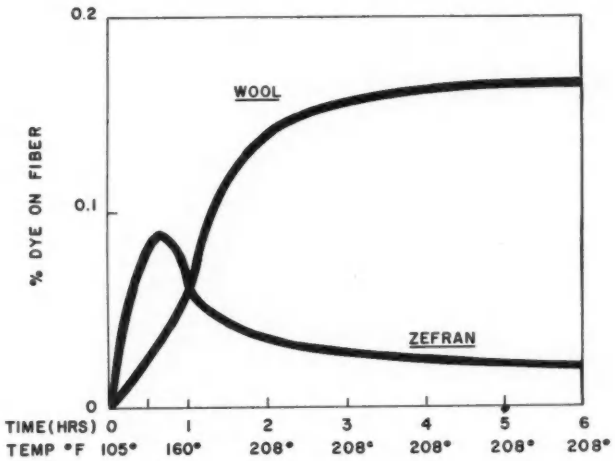


Figure 6
0.1% Acid Blue 80
50/50 blend of Zefran and Wool; 2.0% $(NH_4)_2SO_4$; 30/1

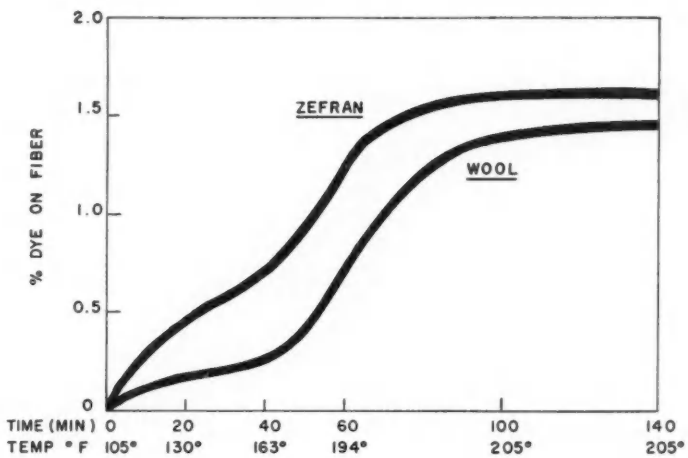


Figure 7
3.0% Neutral Premetalized Navy
50/50 blend of Zefran and wool; 5.0% $(NH_4)_2SO_4$; 30/1

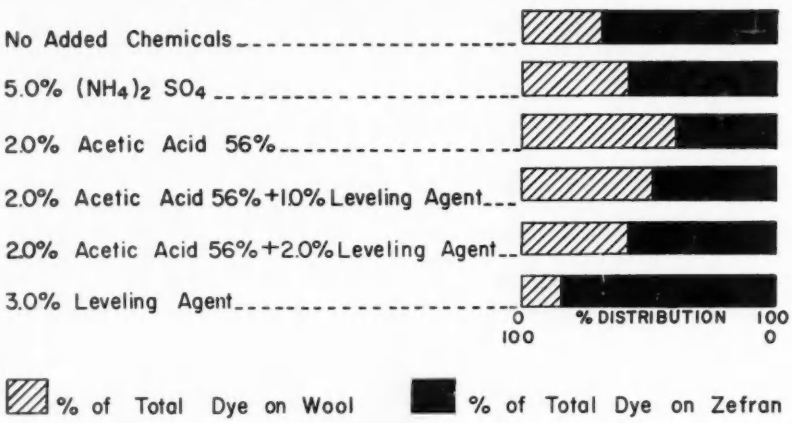

No Added Chemicals
5.0% $(NH_4)_2 SO_4$
2.0% Acetic Acid 56%
2.0% Acetic Acid 56% +1.0% Leveling Agent
2.0% Acetic Acid 56% +2.0% Leveling Agent
3.0% Leveling Agent
0 % DISTRIBUTION 100
100 0
% of Total Dye on Wool
% of Total Dye on Zefran

Figure 8
2.8% Neutral Premetalized Navy
Effect of auxiliary chemicals on dye distribution between wool and Zefran
30/1; 208°F; one hour running time

fibers. The successful application depends upon the following factors:

1) The substantivity of the naphthol in question on each fiber at various temperature levels.

2) Fastness properties of naphthol on each fiber.

3) Temperature manipulation possible in the dyeing system.

Though a temperature of 176°F is recommended for maximum yields on Zefran, fairly good yields are obtained at 140°F. The latter temperature appears to be most advantageous with the naphthol AS-SW type for obtaining a satisfactory union where cooling is not possible. (See Figure 9). In blends of Zefran and unmercerized cotton, it is necessary with naphthol AS-SW to initially carry out the naphtholation at 90°-104°F; followed by heating to 140°F. By comparing the percent exhaustion of naphthol AS-SW on Zefran at 140°F in Figure 10 with that of unmercerized cotton in Figure 12, we see the need for a lower starting temperature for the buildup of the unmercerized cotton.

In cases where the distribution of a naphthol favors the cellulosic fiber, it is possible to build up the Zefran with the types nonsubstantive to the cellulosic fiber; eg, naphthols AS, AS-MX, etc, which would be adsorbed preferentially on the Zefran. (See 1% naphthol AS dyeing—Figure 9). From the experimental work it appears that the higher the substantivity of a naphthol for the cellulosic fiber, the higher the temperature possible for the naphtholation without appreciable loss in yield. An example of this is naphthol AS-SR at higher concentrations. (See Figure 9). Though from Figure 9 we see evidence in some cases of fairly good unions at 104°F, the final shade of the blend is substantially lighter than that at 140°F. Suggested total concentrations of sodium hydroxide in the bath are no greater than 0.3 oz/gal, with naphtholation times of 45 minutes and common salt additions of 0.75-3.0 oz/gal. Figures 10, 11 and 12 show the rate of dyeing for 3.0% naphthol AS-SW on Zefran, viscose

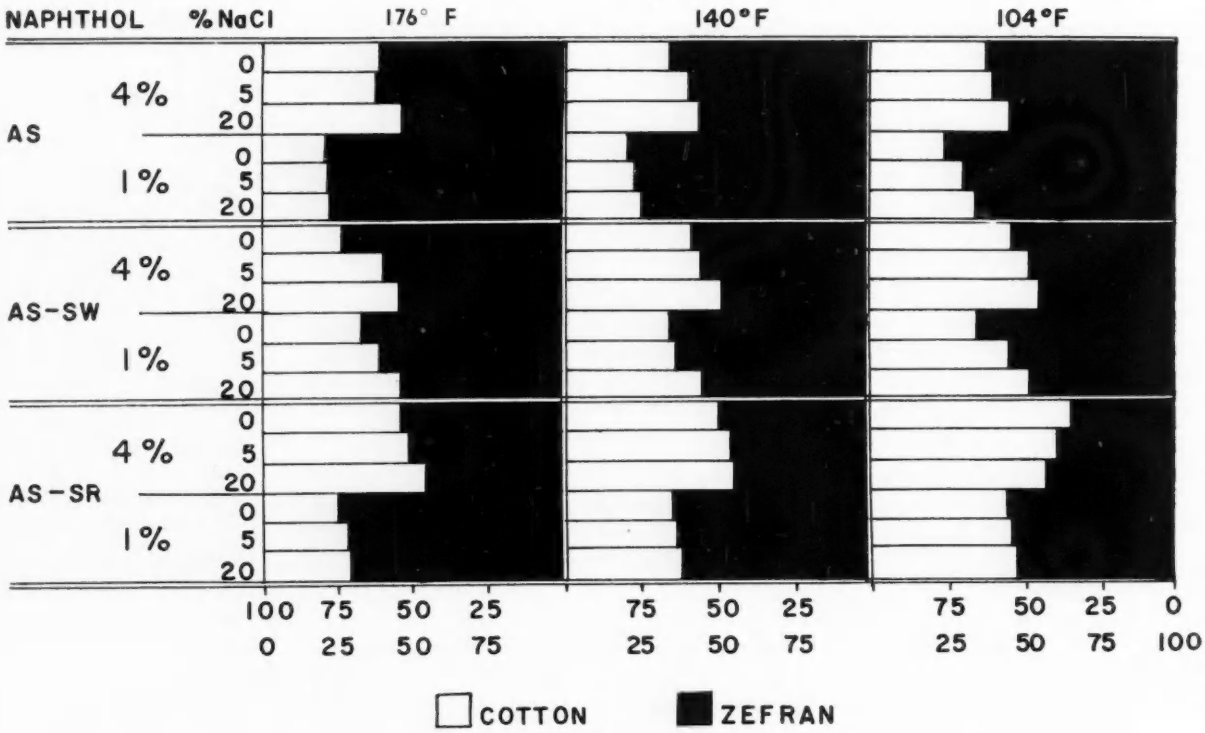


Figure 9
Distribution of naphthols on 65/35 blend of Zefran and mercerized cotton
15/1; one hour dyeing time; coupled with Fast Scarlet R

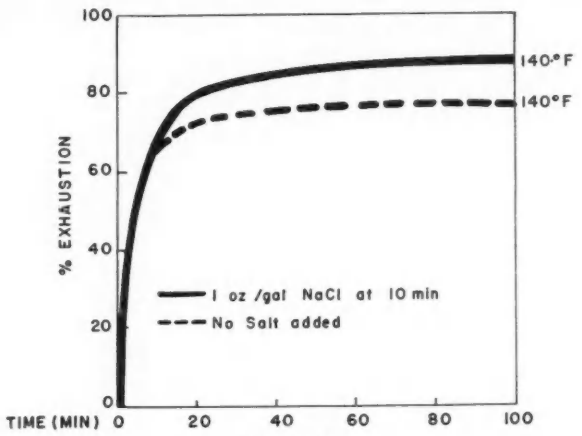


Figure 10
3.0% Naphthol AS-SW on Zefran (15/1)

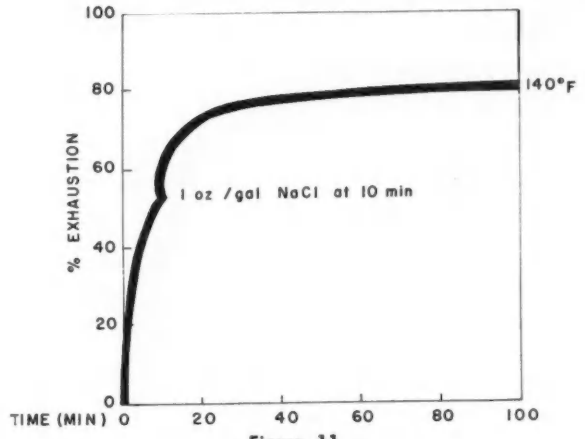


Figure 11
3.0% Naphthol AS-SW on viscose rayon (15/1)

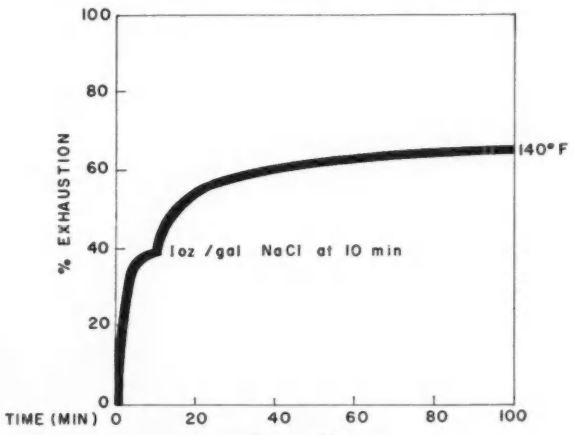


Figure 12
3.0% Naphthol AS-SW on unmercerized cotton (15/1)

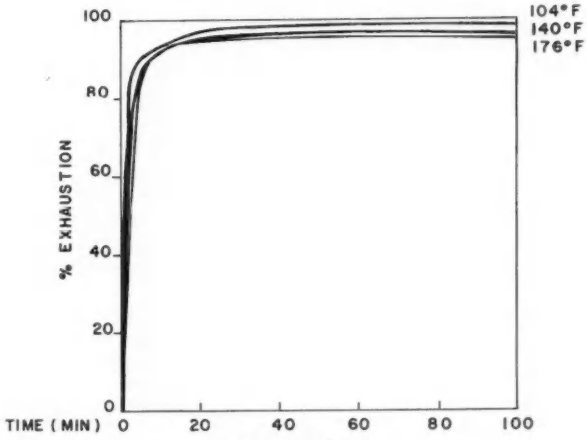


Figure 13
1.0% C I Vat Green 1 on Zefran (30/1); no salt

rayon and unmercerized cotton, respectively. The addition of 1.0 oz/gal of common salt was made after 10 minutes. The coupling procedure for naphthols on Zefran calls for running 20 minutes cold and 20 minutes at 105°-120°F. The time stated for the latter temperatures may be reduced, as in machine dyeing it may take 10-15 minutes to arrive at this temperature. Fast color salts should therefore be tested before application for stability. A diazotized base may differ in stability compared with its fast color salt at these higher temperatures. Final scouring is done at 180°F with a detergent under neutral conditions. The fastness properties of naphthols on Zefran conform fairly well with those of the cellulosic fibers.

VAT DYESTUFFS——The application of vat dyestuffs to Zefran and the results obtained parallel those for the cellulosics in many respects. For example:

1) Pigmentation followed by reduction or straight reduction is possible.
2) Shades up to medium, and in several cases medium heavy, are obtained at temperatures of 105-140°F. Figures 13, 14 and 15 demonstrate this. Notice the similarity in rate of dyeing of Zefran and cotton as shown in Figure 16.
3) Dyeing times of one-half to one hour, depending upon the depth of shade.
4) Salt in concentrations of 1.5-4.5 oz/gal promotes exhaustion in medium and heavy dyeings.

There are several features in the vat dyeing of Zefran which differ from the cellulosics. The following will serve as some examples:

1) There does not exist the same division of hot, warm and cold dyeing colors with the corresponding concentrations of sodium hydroxide, sodium hydrosulfite and salt accompanying each division. Vat dyestuffs do differ in their build up on Zefran, but as yet have not been classified or grouped. With the cellulosics, the hot dyeing dyestuffs are characterized by a high strike and tendency toward unlevel dyeing compared with the cold dyeing types. With Zefran, there is little evidence of unlevel dyeing with any of the separate groups. As to the concentration of sodium hydroxide for Zefran, 4.0%, 6.0% and 8.0% owf are recommended with equal amounts of sodium hydrosulfite for light, medium and heavy shades, respectively; 10.0% of each is recommended for anthraquinone blacks. These figures are principally for package dyeing.
2) For maximum yields in heavy shades, a temperature of 176°F is recommended for one hour. (See Figure 15).

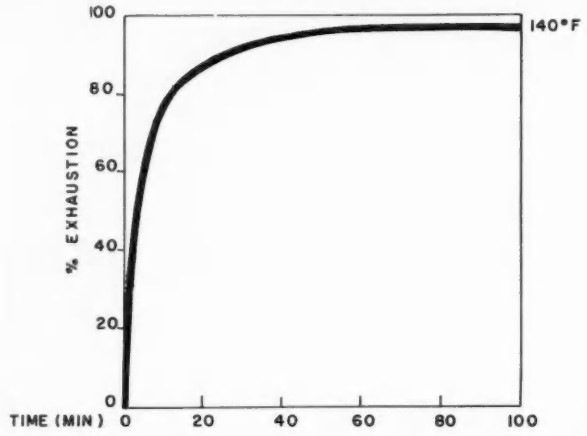


Figure 14
4.0% C I Vat Green 1 on Zefran (30/1); no salt

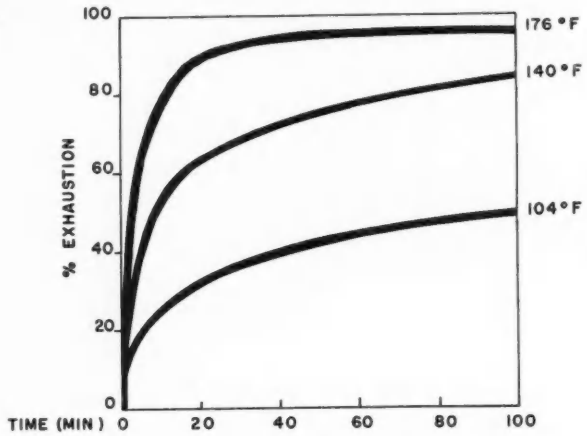


Figure 15
10.0% C I Vat Green 1 on Zefran (30/1); no salt

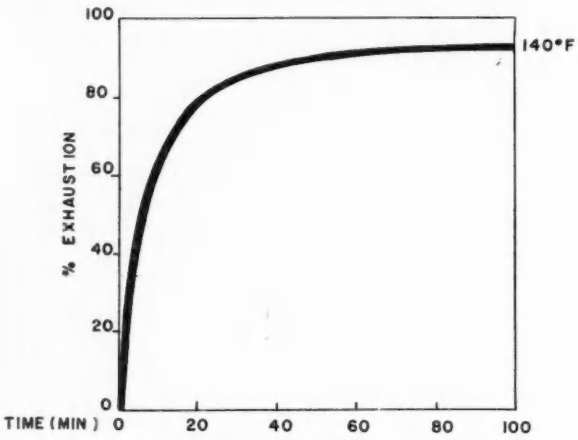


Figure 16
4.0% C I Vat Green on unmercerized cotton (30/1); no salt

3) Oxidation at higher temperatures (160°-176°F) is recommended with 0.10-0.15 oz/gal hydrogen peroxide (35%) and 0.1-0.2 oz/gal acetic acid (56%) for 20 minutes. Chrome and acetic acid accomplish the oxidation at temperatures of 140°-160°F. In machine dyeing, where it takes time to bring the bath up to temperature, it may be possible to get by with shorter times at the maximum oxidation temperature.
4) Soaping off of vat dyestuffs should be carried out in a neutral bath with a detergent.
5) There exist shade differences with some dyestuffs on Zefran compared with the cellulosics.
6) As might be expected, not all dyestuffs build up on Zefran as they do on the cellulosics. This quality is definitely in the minority and does not interfere in getting a full spectrum of colors.
7) For temperatures above 140°F, it is necessary to choose colors stable at elevated temperatures.
8) With blends of Zefran and cotton, a boil-off with 1% TSPP, 1% detergent owf at 200°F is recommended. Times may vary from 15 minutes for yarn to 45 minutes for piece goods. For piece goods, mercerization should precede bleaching; the former can be carried out as with cotton with the exception that the maximum temperature in rinsing off should be at 140°F. Bleaching is accomplished with 0.3% available chlorine as with 100% cotton and succeeds in mote removal.

Hydrogen peroxide should not be used in the bleaching of blends of Zefran and cellulosic fibers. In the dyeing of blends of Zefran and cellulosic fibers, it is important to apply the various points made so far pertaining to the dyeing of Zefran itself.

For simplifying the issues yet to be taken up, the discussion may be divided into three categories: light, medium and heavy shades.

LIGHT SHADES——It is in this category that blends of Zefran and cellulosic fibers have faced the knottiest problem. (See Figure 17) Here were several shades where unions were difficult to obtain due to the fact that Zefran dyed considerably darker than the cellulosic fiber. This was particularly true of such color types as the anthraquinone vat blues, greens and greys. Several, however, give acceptable unions, as Vat Red 35 (*CI* 6800), Vat Violet 13 (*CI* 68700) (see Figure 17), and Vat Black 25 (*CI* 69525/6). Best results with the latter are obtained at 104°F. Mercerization in the piece after yarn dyeing brings the cotton closer in shade to the Zefran.

In order to bring about a more equal dye distribution between the two fibers, a study of possible reserving agents for Zefran was carried out. Good results were obtained with one to five percent. Preventol GDC (2,2′-dihydroxy-5,5′-dichloro diphenylmethane) (40¢/lb). Depending on the percentage used, the Preventol GDC will reserve the Zefran sufficiently to allow the cellulosic fiber to come up in depth to the Zefran. Some dyestuffs are completely reserved by it. It is recommended that the Preventol GDC be applied 15-20 minutes at 104°-140°F prior to reduction. In package dyeing, this can be done during the pigmentation.

For light shades, temperatures of 104°-140°F are recommended, using 4.0% sodium hydroxide, 4.0% sodium hydrosulfite, with dyeing times of 20-30 minutes.

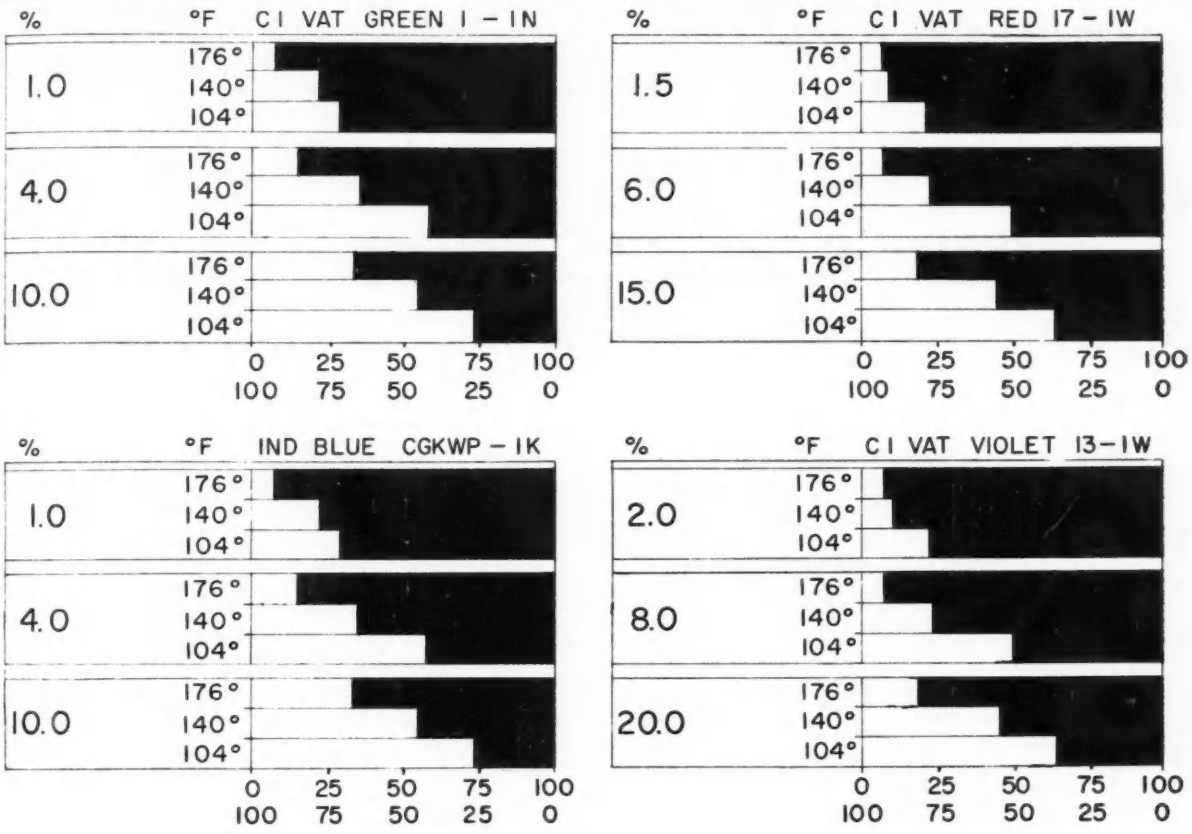


Figure 17
Distribution of vat dyestuffs in a 50/50 blend of Zefran and mercerized cotton. 30/1; one hour; no salt. Shaded area—Zefran; Unshaded—mercerized cotton

MEDIUM SHADES——The union dyeability characteristics are improved at this level, particularly with those colors which showed a preference for Zefran in light shades. (See Figure 17). Medium shades are dyed at 104°-140°F for 30-45 minutes. 5-15% common salt is recommended.

HEAVY SHADES——To obtain the necessary depth of shade on Zefran, it is necessary in most cases to operate at temperatures of 140°-176°F with 20-30% common salt for one hour. In blends of Zefran with mercerized cotton, salt promotes a greater adsorption of color onto the cotton. (See Figure 18). Only dyestuffs stable at high temperatures should be used above 140°F. When necessary, sodium nitrite or dextrin should be used with the Indanthrone blues. It should be realized there are blacks, navys and browns which do not have the type distributions as represented by those dyestuffs in Figures 17 and 18 and so necessitate running at a temperature of 176° to attain the proper depth of shade on the Zefran.

The fastness properties of vats on Zefran correspond closely to those on the cellulosics.

SOLUBLE VAT DYESTUFFS——The soluble vat dyestuffs on Zefran show yields equal to and in several cases better than mercerized cotton. Temperatures for application range from 140°-205°F depending upon dyestuff selection and concentration. Neutral dyeing for 30-45 minutes with 0.75-4.5 oz/gal Glauber salt (calcined) is satisfactory in most cases. Where maximum yields are not realized under neutral conditions, 0.30 oz/gal ammonium sulfate together with 0.10-0.35 oz/gal acetic acid (56%) is recommended. Since oxidation at room temperature is incomplete, the following modified oxidation procedure should be adhered to: Start at room temperature with 1.2 oz/gal sulfuric acid conc and 0.2 oz/gal sodium nitrite and heat to 140°F; running time is 10-15 minutes. Soaping off, as is customary, is carried out under neutral conditions at 205°F. Several of the products based on thiourea recommended by the manufacturers for the stabilization of certain dyestuffs during oxidation tend to cause dull dyeings on the Zefran.

SULFUR DYESTUFFS——Most sulfurs show good yields on Zefran and, with the introduction of the soluble types, provide a handy type to work with. Certain points should be brought out concerning the soluble types. There are members in this class of soluble sulfurs which do not have the equivalent washfastness properties of the powdered types when applied to Zefran. The less alkaline condition of the soluble types is ideally suited for Zefran, particularly at dyeing temperatures of 205°F. At temperatures above 180°F, regular sulfur powdered types should be applied at a pH of 10. The sodium hydroxide from the sodium sulfide may be neutralized with sodium bicarbonate. Good yields are obtained from 140°-205°F, with 20-30% common salt. Oxidation is varied out with 3% sodium bichromate and 2.5% acetic acid (56%) owf at 140°F. 3.0% copper sulphate is used where it normally helps in enhancing the

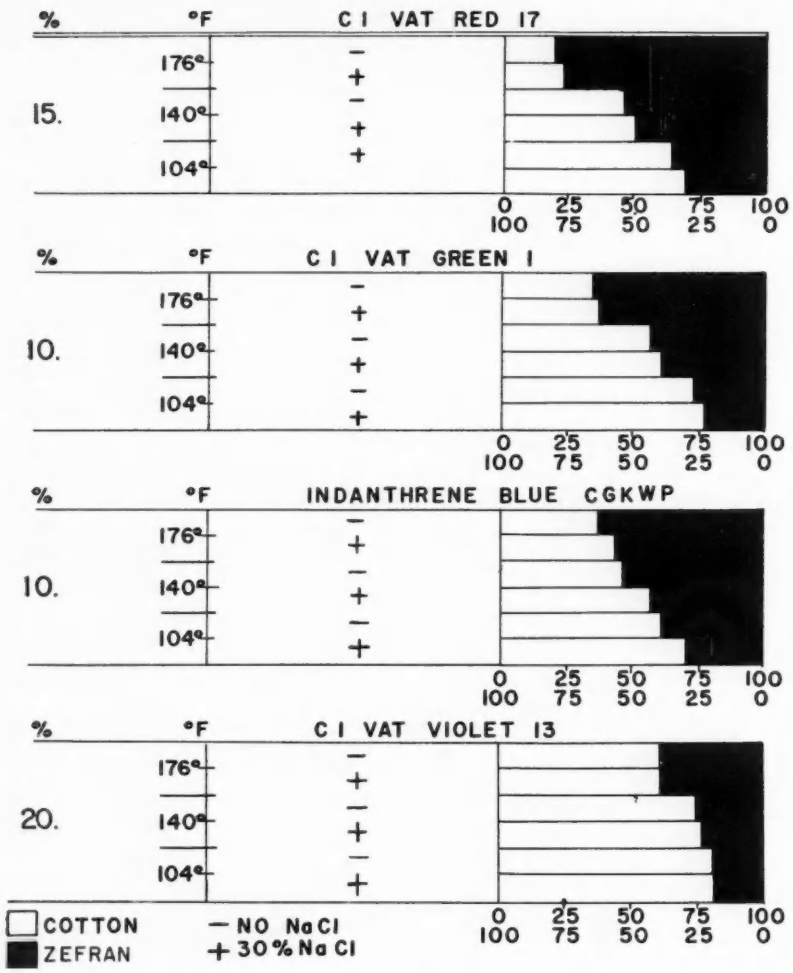


Figure 18
Distribution of high percentages of vat dyestuffs in a 50/50 blend of Zefran and mercerized cotton, with salt; one hour; 30/1

light stability.

Unions with the cellulosic fibers may be carried out at temperatures of 140°-205°F, with 20-30% common salt. The fastness properties of light- and washfastness range from fair to good.

AFTERTREATED DIRECTS——— Aftertreated direct colors are primarily used on Zefran for dark shades. The build up is good, and with selected types the light- and washfastness runs fair to good. Where applicable, they can be used to supplement the neutral premetalized dyestuffs for dark shades. The neutral premetalized dyestuffs may also be used for shading the aftertreated direct colors, provided there is no shade change in the copper salt aftertreatment. The aftertreated directs on Zefran are applied at 205°F for two hours with the use of 20-30% common salt. The aftertreatment is carried out with 2.0-3.5% Gycofix 67, starting cold and heating to 160°170°F and running 30 minutes. A scour is then given with a detergent at 140°-160°F for 15 minutes. Gycofix 67 has shown to produce dyeings of superior washfastness compared to other aftertreating agents.

CONTINUOUS DYEING

PAD-STEAM ——— Good yields have been obtained with vat dyestuffs using 0.5-2.0 oz/gal of sodium hydroxide and equal amounts of sodium hydrosulfite. Minimum concentrations of alkali are recommended at all times. Sulfurs also produce good yields. Steaming times are from 20-60 seconds.

WILLIAMS UNIT ——— Light and medium shades have been obtained by this method. Here, as in the pad-steam-method, minimum amounts of sodium hydroxide are recommended.

PRINTS ——— Zefran shows good yields with vat, soluble vat and insoluble azo dyestuffs. With insoluble azo dyestuffs, 4-5 oz/gal are recommended; below this the build up is not very good. Some thickeners may not be easily removed from Zefran as from cotton; therefore, trials should be carried out for this effect.

ACKNOWLEDGMENT

The author wishes to thank Allan R Wirth for his many contributions, particularly work carried out on rates with the spectrophotometer. Assistance was also received from the other members of Dow Chemical's research dyeing group.

TRADEMARKS

Zefran — Dow Chemical Co
Avalon — Verona Dyestuffs
Cibalan — Ciba Co, Inc
Preventol — General Aniline & Film Corp
Gycofix —Geigy Chemical Corp

PAPERS FOR 1958 CONVENTION

INDIVIDUALS and firms desiring to present papers at the AATCC Convention in Chicago, Oct 30-Nov 1, 1958 should send 100-200 word summaries to:

Leonard J Armstrong
Varney Chemical Corp
Janesville, Wisconsin

before May 15, 1958.

Papers should be of interest to a large segment of the textile industry. Oral presentation should be streamlined to a 20-minute delivery time.

January 24, 1958

AN OPEN LETTER FROM THE PRESIDENT OF AATCC

To the Management of the Textile Industry:

Most of us recognize that the textile industry, more than ever before, needs coordinated technical information to solve its production and merchandising problems.

The complexities brought about by new scientific developments coupled with an aggressive demand by competing industries for the consumer dollar leave us little choice. To stay in business, we must keep pace with the national emphasis on technological achievement.

We have the facilities to do this on an industry-wide level. We have one of the world's finest research groups of some 400 experts who are volunteering their time, talents and experience in assembling a vast array of priceless data in the interest of the wet-processing industry. The machinery for this is provided by AATCC through the laboratories it maintains, the services of its national headquarters staff and a highly organized committee structure.

Every company in the industry is sharing daily in the benefits resulting from AATCC's research and technical program. This program is being geared to the broader needs of the textile industry which we see all around us. It must have whole-hearted support. Not less than $100,000 is requested to do the kind of job that will help give our industry the lift it so urgently needs.

We want every company in the industry to be identified with success of this undertaking as a corporate member of AATCC. We are counting on an enthusiastic response and the cooperation of all concerned to achieve our goal.

Sincerely yours,

s/s Geo. O. Linberg
President

Employment Register

This column is open for two insertions per year, per member, without charge. Blanks can be obtained from, and filed with, the secretary of the Association, Post Office Box 28, Lowell, Mass. It is understood that these will be open to inspection by prospective employers who can obtain further information from the secretary.

58-1

Education: BS, textile chemistry, Lowell Technological Institute (1957); business administration, Univ of Connecticut.
Experience: Summer employment in following fields: management, retail foods company; finishing department, finishing company; dyehouse, textile manufacturer; development chemist, chemical manufacturer; student instructor (1 year).
Age: 23; single; references; draft status: 4A.
Position desired: management training program in textile chemical field.
Location desired: open.

1-27; 2-10

58-2

Education: chemical engineering, Univ of Nancy (France); chemical engineering, dyestuffs and textile chemistry, Warsaw Institute of Technology.
Experience: 11 years, technical agent, Polish branch, French dyestuff manufacturer; 6 years, supervisor, wool dye department in dye application laboratory of dyestuff manufacturer; 6 years plant chemist in leading Canadian woolen and worsted manufacturing company.
Age: 51; married; references.
Position desired: dyestuffs laboratory; quality control; research; wool-worsted plant chemist; technical sales.

1-27; 2-10

58-3

Education: BS, textile chemistry, Lowell Technological Institute (1957).
Experience: student instructor; chemist, plastics manufacturer.
Age: 28; single; references.
Position desired: textile chemist.
Location desired: East or Mid-west.

1-27; 2-10

58-4

Education: BS, textile chemistry, North Carolina State College; textile high school graduate.
Experience: textile laboratory technician; dyehouse production trainee.
Age: 27; single; references.
Position desired: technical sales-service.
Location desired: New York, Philadelphia or California.

2-10; 2-24

58-5

Education: BS, chemistry; post-graduate study.
Experience: defect analyst; plant chemist; dyer; domestic & foreign textile machine sales.
Age: 30; single; references; resume on request.
Position desired: sales; tech sales; administration.
Location desired: New York, New Jersey, some travel, or foreign.

2-10; 2-24

ACTIVITIES OF THE LOCAL SECTIONS

Mid-West

THE mid-Winter meeting of the Mid-West Section will be held February 15 at the Bismarck Hotel, Chicago, Ill. The Midwest Woolen Manufacturers Association has accepted the Section's invitation to attend.

At the afternoon meeting, Gerald Laxer, director of science and industry, The Wool Bureau Inc, will discuss "Finishing Processes and End Usage of Woolen Fabrics".

Following dinner, H F Clapham, assistant technical manager, Dyes & Chemicals Div, E I duPont de Nemours & Co, Inc, will speak on the subject "Recent Developments in Dyes and Dyeing Techniques for Wool".

Northern New England

TWO nuclear scientists from the Boston area, William B Fitzmaurice and John Wood of Tracerlab, Inc, presented a discussion of "The Industrial Nuclear Applications for Continuous Weight Measurement" at the January 17th meeting of the Northern New England Section, held at the Colonial Inn, Lynnfield, Mass.

Textile applications were reported to be limited at this time, but numerous examples of applications in other industries were cited.

Robert D Robinson, Bachmann-Uxbridge Worsted Co, Inc, NNE program chairman, arranged the meeting. Chairman Edward B Bell, Textile Aniline & Chemical Co, presided, and John R Markgren, W C Durfee Co, Inc served as dining chairman.

South Central

THE South Central Section held its Winter Meeting at the Hotel Patten, Chattanooga, Tenn, Saturday, January 18, 1958, with eighty in attendance.

Speaker at the technical session was A S Messer, Dow Chemical Co, who discussed "The Dyeing of Zefran".

The banquet speaker was Lt Col Dale M Engstrom, who presented a film entitled "Challenge of Outer Space", which is narrated by Dr Wernher von Braun.

DELAWARE VALLEY SECTION OFFICERS AND GUESTS—JANUARY 14th MEETING

Standing (l to r): **Arthur W Etchells, sectional committeeman; Weldon G Helmus, Fair Lawn Finishing Co, AATCC vice president, Central Atlantic Region; William H Bertolet III, councilor; Charles N Kuzma Jr, sectional committeeman; Thomas H Hart, councilor; Samuel H Loper Jr, sectional committeeman; George G Wunsch, North American Lace Co, sectional publicity chairman.**

Seated (l to r): **Clarence A Seibert, treasurer and councilor; L Kevin McChesney, vice chairman; William S Sollenberger, chairman; Donald W Robinson, councilor; Ernst W Empting, secretary; Herman Bogaty, guest speaker.**

Delaware Valley

HERMAN Bogaty, Harris Research Laboratories, Inc, Washington, D C, served as guest speaker at the Delaware Valley Section's January 14th meeting at Kugler's Restaurant, Philadelphia, Pa. Mr Bogaty presented a progress report on a project aimed at engineering shrink-resistant wool fabrics (See page 102).

The following slate of officers for 1958 was installed: *Chairman*—William S Sollenberger, American Viscose Corp; *Vice chairman*—L Kevin McChesney, Leatex Chemical Co; *Treasurer*—Clarence A Seibert, Scholler Bros, Inc; *Secretary*—Ernst W Empting, Verona Dyestuffs; *Councilors*—Carleton T Anderson, Ciba Co, Inc; William H Bertolet 3rd, Laurel Soap Co; Thomas H Hart, Hart Products Corp; Donald W Robinson, Para-Chem, Inc; Clarence A Seibert; *Sectional Committee*—Jack A Adams, Paar Engineering Co; Arthur W Etchells, Hellwig Dyeing Co; Charles N Kuzma Jr, Amalgamated Chemical Co; Samuel H Loper Jr, E I duPont de Nemours & Co, Inc.

William S Sollenberger (left), new chairman of the Delaware Valley Section, presents a watch to outgoing chairman Donald W Robinson on behalf of the Section for his fine leadership in 1957.

AATCC MEMBERS ARE URGED TO NOTIFY THE SECRETARY'S OFFICE OF ANY ADDRESS CHANGE.

Membership Applications

SENIOR

Karapet Avakian—Managing & sup screen printing, Colony Textile Printing Co, Inc, Woonsocket, RI. Sponsors: N R Gaouette, J E DuBois. (RI).

Henry G Black——Salesman, Tennessee Corp, Atlanta, Ga. Sponsors: R L Smart Jr, W P Williams. (S).

William Burgess—Head dyer, Rock Hill Printing & Finishing Co, Rock Hill, SC. Sponsors: A R Thompson, S L Hayes. (P).

Jack W Burnette—Salesman, tech representative, The Dow Chemical Co, James River Div, Lee Hall, Va. Sponsors: C M Alberto, W B Guerrant. (P).

Ralph E Crean—Supt dyeing & finish, Shawmut Woolen Mills, Stoughton, Mass. Sponsors, J M Redding, V J Krukonos. (NNE).

Martin DeBerardinis — Chemical salesman, Penn Industrial Chemical Corp, Jacksonville, Fla. Sponsors: J T Hall Jr, W B Griffin. (S).

Carlo DeMarco—Chemist, Quartermaster R&E Command, Natick, Mass. Sponsors: E J McNamara, T Larson. (NNE).

Raymond Dorchies—Textile chemist, Soluol Chemical Co, Inc, Natick, RI. Sponsors: C Nathanson, A Hustwit. (RI).

Alex Etzel—Night supt, Portland Woolen Mills, Inc, Portland, Ore. Sponsors: R Chamberlain, A McKenzie. (PN).

Frank Flanagan—Mill mgr, James Thompson & Co, Inc, Valley Falls, NY. Sponsors: E A Chevrette, I J Smith. (Met).

C M Funderbunk—Dyeing foreman, Avondale Mills, Alexander City, Ala. Sponsors: M T Barnhill, H G Smith. (S).

Richard Harrison—Senior partner, Pacific Prints, Oakland, Calif. Sponsors: J M de la Barre, D P Driscoll. (PS).

Robert Hodgson Jr—Repres, Tennessee Corp, Atlanta, Ga. Sponsors: W P Williams, D Waller. (MW).

William Holt — Textile chemist, Stein-Hall Ltd, Montreal, Canada. Sponsors: L F Costello, F W Perry.

Howard Lathan—Wet finish overseer, fancy worsteds, J P Stevens & Co, Inc, Milledgeville, Ga. Sponsors: R S Sappington, H L Thomas. (S).

Robert Luckadoo—Overseer-dyeing, Spindale Mills, Inc, Spindale, NC. Sponsors: A R Thompson, C J Horne. (P).

William J McMillan — Overseer, dyeing & finishing, Crown Mfg Co, Manchester, NH. Sponsors: R Zametkin, G O Linberg. (NNE).

Clyde Miller—Salesman, Ciba Co, Inc, Charlotte, NC. Sponsors: A R Thompson, E T Mobley. (P).

David Moran—Supervisory tech, U S Customs Lab, New York, NY. Sponsors: S Goldman, T Johnidis. (Met).

Virginia Ruggiero—Dir of Text Lab Div, Bristol Research Associates, Inc, Bristol, RI. Sponsors: P T Bodell, E R Kaswell. (RI).

Manley Sanderson—Chemist, Brookneal Mills (Burlington), Brookneal, Va. Sponsors: F A Prisley, T Peel. (P).

Robert Savage — Special repres, Chemical Div, Goodyear Tire & Rubber Co, Needham Heights, Mass. Sponsors: E W Scott, W F Gerrow. (NNE).

M J Shadrick—Asst dyer, Crystal Bleachery, Chickamauga, Ga. Sponsors: H G Smith, S T Holland Jr. (S).

Patsy Stefanacci—Plant chem, Nu-Dye & Finish Co, Inc, Paterson, NJ. Sponsors: G D Maynard, A J Picciotti. (Met).

Calvin Steele—Lab, Franklin Process Co, Central Div, Chattanooga, Tenn. Sponsors: H Whelchel, E V Helms. (SC).

Harold Watson—Res chem, Research Div, Dan River Mills, Inc, Danville, Va. Sponsors: H Y Jennings, H M Chase. (P).

Harold Whittemore — Gen mgr, Warwick Chemical Co, Long Island City, NY. Sponsors: A J Picciotti, G D Maynard Jr. (Met).

Kenneth Whitney — Textile engineer, American Viscose Corp, Marcus Hook, Pa. Sponsors: J A Woodruff, W S Sollenberger. (DV).

F R Williamson—Overseer, dry finish, J P Stevens & Co, Inc, Milledgeville, Ga. Sponsors: R S Sappington, J M Stephenson. (S).

JUNIOR

J F Bradley—Tech sales repres, Francolor Inc, Woonsocket, RI. Sponsors: G O Linberg, J C Smith. (RI).

L A Edelman—Tech service mgr, Warwick Chemical Co, Long Island City, NY. Sponsors: A J Picciotti, G D Maynard Jr. (Met).

H R Kennedy—Textile chemist, E I duPont de Nemours & Co, Inc, Wilmington, Del. Sponsors: G T Hug, W Wygand Jr. (DV).

Billy Swilley—supervisory trainee, J P Stevens & Co, Inc, Milledgeville, Ga. Sponsors: R S Sappington, H L Thomas. (S).

ASSOCIATE

A J Arellano—Tech service supervisor, DuPont SA de CV, Mexico.

R W Freeman—Collins & Aikman Corp, Albermarle, NC (P).

J W King—Overseer, final inspection, Milledgeville Plant, J P Stevens Co, Milledgeville, Ga. (S).

C H Peterson—Supt, Fabric Section, Special Products Div, Lord Mfg Co, Erie, Pa. (DV).

Harry Rowden—Salesman, General Dyestuff Co, Chattanooga, Tenn. (SC).

Thomas Summers—Chemist, dyehouse, Pacific Mills, Raeford, NC. (P).

Gus Allison—Sales rep, Southern States Chemical Co, Greenville, SC. (P).

David Tucker — Laboratory dyer, Collins & Aikman Corp, Albermarle, NC. (P).

STUDENT

I D Alewine, R H Barker, R C Bratton, K L Brewton, J M Fox, Leon LeGrand, Jack A Lynch, Henry Perkins Jr, Ervin Poole, and **John Turner**—Students, Clemson College. Sponsor: J Lindsey. (C).

A W Godfrey Jr and **Gordon H Howard** — Students, Rhode Island School of Design. Sponsor: H B Sturtevant. (RISD).

Raymond Rankin and **Tommy Zau**—Students, Bradford Durfee College of Technology. Sponsor: J Watters. (D).

Bobby Tidwell—Student, Georgia Institute of Technology. Sponsor: W Postman. (G).

TRANSFER TO SENIOR

J H Martin—Plant chemist, Fairforest Finishing Div, Reeves Bros, Spartanburg, SC. Sponsors: J F McAlister, W E Edwards. (P).

Louis R Beck Jr—Jr scientist, Textile Research Inst, Princeton, NJ. Sponsors: J H Menkart, L Rebenfeld. (Met).

James C Childress—Dyer, Kingsboro Mills, Daisy, Tenn. Sponsors: C B Ordway, W G Quick. (SC).

FINANCIAL STATEMENTS

Report of Independent Public Accountants

To the Members of the
American Association of Textile
Chemists and Colorists

We have examined the balance sheet of the American Association of Textile Chemists and Colorists and related statements of income and fund balances as of July 31, 1957. Our examination was made in accordance with generally accepted auditing standards and accordingly included such tests of the accounting records and such other auditing procedures as we considered necessary in the circumstances, but it was not practicable to communicate with members to confirm the amount of recorded dues and subscriptions.

In our opinion the accompanying statements present fairly the financial position of the American Association of Textile Chemists and Colorists at July 31, 1957 and the net income for the fiscal year then ended in conformity with generally accepted accounting principles.

Prior to the current fiscal year the books of the Association have been maintained on a cash basis. Effective August 1, 1956 the Association adopted the accrual method of accounting.

75 Federal Street
Boston 10, Mass.
October 18, 1957

PRICE WATERHOUSE & CO.

EXHIBIT I

AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS

Balance Sheet—July 31, 1957

Assets

RESEARCH AND GENERAL FUND

Cash in banks (checking accounts) and on hand		$ 64,916.03
Savings bank deposits		78,789.70
United States Government obligations, at cost which is approximate market value		132,040.13
Other marketable securities at cost (approximate market value $189,500)		141,093.80
Accounts receivable:		
Technical supplies, less allowance of $122.70 for doubtful balances	$ 1,389.22	
Refundable deposit	6,000.00	7,389.22
Advance expense funds and prepaid postage		3,929.39
Inventory of technical supplies, at cost		13,535.38
Equipment, at cost:		
Research department	$21,192.70	
General office	8,763.57	
	$29,956.27	
Less depreciation	21,491.80	8,464.47
		$450,158.12

SPECIAL FUNDS

Savings bank deposits	$ 24,046.86
	$ 24,046.86

COLOUR INDEX JOINT PROJECT (NOTE 2)

Amount receivable from Research and General Fund	$ 2,499.76
Accumulated net costs of production, distribution, etc	51,078.97
	$ 53,578.73
Total assets	$527,783.71

Liabilities and Fund Balances

RESEARCH AND GENERAL FUND

Accounts payable		$ 1,743.86
Amount payable to Colour Index joint project		2,499.76
Accrued liability, Perkin Proceedings (Note 1)		35,250.00
Unexpended research funds:		
Delaware Valley Section—		
High-temperature dyeing project	$ 1,050.00	
Piedmont Section—		
Radio-active chemical technique study	500.00	1,550.00
Reserve for conventions (Note 1)		13,499.95
Fund balance (Exhibit II):		
Appropriated:		
Research and technical activities	$ 71,000.00	
Current operating reserve, general office	85,000.00	
Colour Index—balance of approximate liability under joint agreement (Note 2)	74,000.00	
	$230,000.00	
Unappropriated	165,614.55	395,614.55
		$450,158.12

SPECIAL FUNDS

American Dyestuff Reporter Prize Award Fund (Exhibit IV)	$ 11,744.21
Olney Medal Fund (Exhibit IV)	12,302.65
	$ 24,046.86

COLOUR INDEX JOINT PROJECT (NOTE 2)

Subscriptions to Colour Index received	$ 53,578.73
	$ 53,578.73
Total liabilities and fund balances	$527,783.71

EXHIBIT II

AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS

Statement of Research and General Fund
Year Ended July 31, 1957

Balance per books, July 31, 1956:		
General Fund	$206,950.65	
Research Fund	120,906.65	
Technical Supplies fund	28,253.22	$356,110.52
Add assets not recorded on the books at July 31, 1956 in order to reflect adoption of accrual method of accounting:		
Accounts receivable	$ 969.53	
Inventory of technical supplies	14,619.32	
Equipment, less depreciation	5,217.15	20,806.00
Adjusted balance, July 31, 1956		$376,916.52
Net income for the year (Exhibit III)		18,698.03
Balance per books, July 31, 1957		$395,614.55

EXHIBIT III

AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS

Research and General Fund
Statement of Income
Year Ended July 31, 1957

Income:			
Membership dues:			
Corporate memberships		$57,642.50	
Sustaining memberships		510.00	
Senior, Junior, Associate and Student memberships		67,352.55	$125,505.05
Investment income			11,001.75
Gain on sale of securities			16,696.35
Royalties			5,523.28
Sales of technical supplies		$13,684.15	
Deduct:			
Cost of purchases and handling	$9,187.53		
Decrease in inventory of technical supplies	1,083.94	10,271.47	3,412.68
			$162,139.11
Deductions from income:			
Research costs and expenses:			
Salaries		$46,666.02	
Social security, group life and compensation insurance		1,262.43	
Supplies and services		7,841.43	
Travel and meetings		6,113.94	
Corporate membership promotion		2,265.62	
Provision for depreciation		945.63	$ 65,095.07
General office expenses:			
Salaries		$39,812.73	
Social security, group life and compensation insurance		782.05	
Professional services		4,112.06	
Supplies and services		5,039.85	
Travel and meetings		3,368.14	
Dues to other associations		235.00	
Publicity		1,170.12	
Provision for doubtful accounts receivable		122.70	
Provision for depreciation		769.77	
Other general expenses		288.28	55,700.70
Other charges:			
Cost of Reporters and Yearbooks supplied to members		$18,309.05	
Section membership allowances		4,336.26	22,645.31
			$143,441.08
Net income			$ 18,698.03

EXHIBIT IV

AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS

Statement of Special Funds
Year Ended July 31, 1957

American Dyestuff Reporter Prize Award Fund			
Balance July 31, 1956			$ 8,309.26
Income:			
Gain on transfer of securities at market value, November 30, 1956, to Research and General Fund		$3,328.48	
Investment income		306.47	3,634.95
			$11,944.21
Disbursement:			
1957 Prize Award			200.00
Balance July 31, 1957			$11,744.21
Olney Medal Fund			
Balance July 31, 1956:			
Cash and investments (at cost)		$7,550.44	
Cost of medal on hand		100.00	$ 7,650.44
Income:			
Gain on transfer of securities at market value, November 30, 1956, to Research and General Fund		$3,651.02	
Gain on sale of securities		801.24	
Investment income		302.42	4,754.68
			$12,405.12
Deduct—Cost of medal and engraving for 1956 award			102.47
Balance July 31, 1957			$12,302.65

NOTES TO FINANCIAL STATEMENTS

AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS

NOTE 1—RESERVE FOR CONVENTIONS:

Changes in the reserve for conventions during the year ended July 31, 1957 are summarized as follows:

Balance July 31, 1956			$44,546.27
Deduct:			
Loss on Perkin Centennial Convention			$ 6,930.11
Deficit to July 31, 1957 on publication of Perkin proceedings (See below):			
Printing and distribution costs		$36,488.21	
Less—Contributions, advance sales, etc		12,372.00	24,116.21
			$31,046.32
Balance July 31, 1957			$13,499.95

The unpaid cost of $35,250 for printing the Perkin proceedings, shown as a liability in the balance sheet, is included in the amount of printing and distribution costs shown above. Of the $24,116.21 net charge against the reserve, the Council had approved only $14,000 as of July 31, 1957 and it will be necessary for the Council to approve the balance of approximately $10,000. The total charge was incurred to provide each registrant at the Perkin Centennial Convention with a printed copy of the proceedings.

NOTE 2—COLOUR INDEX:

The Colour Index (Second Edition) when complete will consist of four volumes. As of July 31, 1957 the Association had received 525 subscriptions for complete sets of four volumes and 3 partial subscriptions. In addition, 47 subscriptions for complete sets had been received for the account of the Society of Dyers and Colourists (4 sets only to be shipped by the Association and the balance from England). Total subscriptions received amounted to $53,578.73.

The Association has received a total of 1,500 copies each of volumes I and II and has distributed to subscribers a total of 532 copies of each volume, leaving a balance of 968 copies of each volume in inventory at July 31, 1957.

Under the agreement dated January 18, 1952 between the Association and the Society of Dyers and Colourists of Bradford, England, all costs in connection with the publication and distribution of the Colour Index (Second Edition) are to be borne equally by the parties thereto. Future net losses or revenues arising from the production and sale of this work are likewise to be borne or shared equally by the parties. The agreement requires annual equalization settlements between the parties with respect to costs paid and revenues received by each. The first equalization settlement made as of December 31, 1956 required a payment of $4,078.09 to the British Society. This amount is included in the total net accumulated costs of $51,078.97 incurred by the Association for the account of the joint project. The costs to date have been paid out of subscriptions received.

The Association was originally committed under the agreement to underwrite half the estimated cost of production or approximately $126,000. The commitment has been reduced through subscriptions received, etc. to approximately $74,000 as at July 31, 1957.

FUTURE PAPERS

AATCC Convention

"An Evaluation of Test Methods for Fulled Fabrics"—Northern New England Section

"The Study of Lightfastness of Selected Direct Colors on Cottons, Rayon and Cotton-Rayon Blends"— Delaware Valley Section

"Pollution Control of New England Interstate Waters"—Joseph C Knox, New England Interstate Water Pollution Control Commission

"Disposal of Combined Textile Finishing Wastes and Domestic Sewage" —George G Bogren, Weston & Sampson

"Treatment of Mixtures of Textile Wastes and Domestic Sewage. IV—Research in Various Methods of Treatment"—R Hobart Souther and Thomas A Alspaugh, Cone Mills Corp

"Textile Processing Chemicals"—Lester D Berger Jr, Union Carbide Chemicals Co

"The Colorimetric Properties of Bleached Cotton"—E S Shanley, Arthur D Little, Inc

"Recent Developments in Electronic Instruments for Textile Processes"—R Hosmer, The Foxboro Co

"Research and the Future of the Textile Industry"—Raymond Stevens, Arthur D Little, Inc

"Chemical Trends in the Textile Industry"— Milton Harris, Harris Research Laboratories, Inc

"Nuclear Energy—A New Tool for the Textile Industry"—Henry A Rutherford, North Carolina State College

"Automation with Process Instruments"—W H Ridley, The Foxboro Co

"Scouring Grease Wools Neutral"—E C Hansen, General Aniline & Film Corp

"Prevention of Wool Fabric Shrinkage with Polyamide—Epoxide Resin Finishes"—C E Pardo and R A O'Connell, Western Regional Research Laboratory, USDA

"Elimination of Static Electricity from Textiles by Chemical Finishing" —E I Valko, G C Tesoro and W Ginilewicz, Onyx Oil & Chemical Co

"Effect of Laundering on Chlorine Retention and Crease Resistance of Cotton Finished with Dimethylol Ethylene Urea"—Osborne C Bacon Jr, J Edward Smith and Lehman E Hughes, E I duPont de Nemours & Co, Inc

"Wet-soiling Studies on Resin-treated Cotton Fabrics"—Laurence W Mazzeno Jr, Russell M H Kullman, Robert M Reinhardt, Harry B Moore and J David Reid, Southern Regional Research Laboratory, USDA

"The Mechanism of Dyeing Orlon 42 Acrylic Fiber"—T Vogel, J M A deBruyne and C L Zimmerman, American Cyanamid Co

"The Dyeing of Filament Nylon with Acid Dyes"—J A Bittles, J A Brooks, J J Iannarone Jr and H P Landerl, E I duPont de Nemours & Co, Inc

"Evaluation of Carriers for Dacron Dyeing"—Peter J Scott, The Tanatex Corp

"Some Considerations on the Azoic Insoluble Dyes in Printing"—Dorel Marian, Compagnie Francaise des Matieres Colorantes

Local Sections

"Three Sides to the Public Relations Triangle"—M B Eubanks, Riegel Textile Corp

"Reactive Dyestuffs in the Dyeing of Cellulosic Textiles"—Maurice R Fox, Imperial Chemical Industries, Ltd.

Research Committee Report

"Chlorophyll Contamination of Wool and Its Effect on the Lightfastness of Dyed Shades"—Subcommittee on Continuous Wool Scouring Processes

Contribution

"Combined Treatment—Bleachery Waste and Domestic Sewage"—John L Brown Jr, Cannon Mills Co

Non-Proceedings

"Recent Work in the Mechanism of the Thermal Degradation of Cellulose"—Roy C Laible, Quartermaster Research & Development Command

"Effect of Dye and Acid Valence in Wool Dyeing"—John H Skinkle, Lowell Technological Institute

"A Practical Approach to the Evaluation of a Finishing Agent"—John J McDonald and Robert E Morrison, Lowell Technological Institute

"Rapid Graphical Computation of Small Color Differences"—F T Simon and W J Goodman, Union Carbide Corp

"Identification of Unknown Synthetic Fibers"—Sidney G Smith, Security Mills, Inc.

General Calendar

AMERICAN OIL CHEMISTS SOCIETY
April 21-23 (49th Annual Meeting, Peabody Hotel, Memphis, Tenn); July 14-18 (Short course on soaps and synthetic detergents, Princeton Inn, Princeton, NJ); Oct 20-22 (Sherman Hotel, Chicago); April 20-22, 1959 (Roosevelt Hotel, New Orleans, La); Sept 28-30 (Statler Hotel, Los Angeles, Calif)

AMERICAN SOCIETY FOR TESTING MATERIALS (COMMITTEE D-13)
Mar 18-21 (Spring Meeting, Sheraton Park Hotel, Washington, D C); Oct 14-17 (Sheraton McAlpin Hotel, New York, N Y)

THE DRYSALTERS CLUB OF NEW ENGLAND
Mar 2 (Hotel Vendome, Boston, Mass); June 20 (Outing—Wachusett Country Club, West Boylston, Mass)

AMERICAN SOCIETY OF MECHANICAL ENGINEERS
June 9-12 (National Conference on Materials Handling, Public Auditorium, Cleveland, O)

CANADIAN TEXTILE CONFERENCE
May 6-8 (Queen Elizabeth Hotel, Montreal, Quebec)

DIVISION OF CLOTHING AND TEXTILES IN EXTENSION, TEACHING AND RESEARCH, UNIVERSITY OF GEORGIA
Nov 7-8 (2nd Textile Seminar, Georgia Center for Countinuing Education, Athens, Ga)

THE FIBER SOCIETY
April 30-May 1 (The Clemson House, Clemson SC); Sept 9-10 (Montreal, Que)

INSTITUTE OF TEXTILE SCIENCE
Mar 29 (2nd Annual Meeting and Fifth Scientific Session, Ontario Research Foundation, Toronto, Ont)

INSTRUMENT SOCIETY OF AMERICA
May 12-14 (Analysis Instrumentation Division Symposium, Shamrock Hilton Hotel, Houston, Texas)

INTERNATIONAL TEXTILE MACHINERY EXHIBITION
Oct 12-15 (Belle Vue, Manchester, England)

DELTA KAPPA PHI FRATERNITY
April 24-26 (New Bedford Hotel, New Bedford, Mass)

INTER-SOCIETY COLOR COUNCIL
Mar 25-26 (27th Annual Meeting, Sheraton Park Hotel, Washington, DC)

LAUNDRY, DRYCLEANING AND ALLIED TRADES' EXHIBITION
July 17-26 (Olympia, London, England)

NATIONAL ASSOCIATION OF HOSIERY MANUACTURERS
April 21-22 (Annual Meeting and Hosiery Industry Conference, Hotel Roanoke, Roanoke, Va)

NATIONAL COTTON COUNCIL OF AMERICA
Oct 1-2 (Chemical Finishing Conference, Washington, DC)

PURDUE INDUSTRIAL WASTE CONFERENCE
May 5-7 (Purdue Memorial Union Bldg, Purdue Univ, Lafayette, Ind)

SOUTHERN TEXTILE EXPOSITION
Oct 6-10 (Greenville, SC)

SYNTHETIC ORGANIC CHEMICAL MANUFACTURERS ASSOCIATION OF THE UNITED STATES
Luncheon meetings at the Hotel Roosevelt, New York, NY: Feb 11, Mar 6, April 8, June 10, Sept 9, Oct 8, Nov 12. Outing May 26-28, Shawnee Inn, Shawnee, Pa)

TEXTILE INSTITUTE
April 23 (Annual Meeting, Nottingham, England)

TUFTED TEXTILE MANUFACTURERS ASSOCIATION
June 5-7 (Dayton Plaza Hotel, Daytona Beach, Fla)

News of the Trade

Marx Elected NAFTF President

Lawrence Marx, Jr, vice-president, Clearwater Finishing Co, Clearwater, SC, was elected president of the National Association of Finishers of Textile Fabrics at its 44th annual meeting at the Waldorf-Astoria, New York. He succeeds J Marshall Cole, Cold Springs Bleachery, Yardley, Pa, who became chairman of the Executive Committee. Godfrey S Rockefeller, Cranston Print Works Co, Cranston, RI, and Richard D Wood Jr, Millville Mfg Co, Millville, NJ, were elected vice presidents. Association secretary Joseph E Hoesl was re-elected treasurer.

In his annual address to the Association, retiring president Cole noted that the Association is prepared to cooperate in a constructive program in the field of terminology and criteria for "wash and wear" finishes. He indicated that the finisher has an obligation to define his "wash and wear" product in such terms that converter, cutter, retailer and consumer can understand them and also to produce consistently a product that lives up to this definition from the standpoint of consumer satisfaction.

Secretary Hoesl noted in his annual report to the Association that:

"Plant operations in the cotton textile finishing industry during 1957 were marked by an acceleration of the decline in production that started almost two years ago. As a whole, the industry produced 7.4 billion yards of bleached, dyed or printed cotton goods during the year—a drop of 7.5 percent from the 1956 level. The production level in 1955 of 8.1 billion yards was the high point in the history of the industry—production in the following year of 1956 fell off 1.3 percent to 8.0 billion yards and continued its drop last year at an accelerated rate of 7.5 percent. The duration and degree of this downturn for the past two years varied with each of the principal types of finishing processes.

"Bleached and white-finished finished cotton goods started downward during the 4th quarter of 1956 and production remained at a lower level during the whole of 1957. It is estimated that the output in 1957 was 3.3 billion yards or 7 percent below the previous year.

"The downturn in production of plain dyed cotton goods was less drastic than other categories. The decline from the peak of 2.7 billion yards in 1955 amounted to 3.7 percent in 1956 which was followed by another drop of 2.5 percent in 1957 to an estimated 2.5 billion yards. There were some signs of a recovery in the 2nd quarter of 1957, but these disappeared completely by the 4th quarter of that year.

"The decline in production of cotton prints was more severe than in the other categories of finished goods. From a peak of 2.1 billion yards in 1955 production fell off to 1.9 billion yards in 1956 and then down to 1.6 billion yards last year—a drop of 9.1 percent and 14.9 percent, respectively.

"The general decline in finishing activity during the past two years has taken its toll on the industry. In this period 13 cotton finishing plants have been reported to have closed down and liquidated—9 of these plants were engaged in printing with a total of 79 print machines taken out of production. At the year end commission finishers reported that finishing charges remain depressed and unprofitable except for certain quality finishes which have remained firm and in some instances were increased.

"A seasonal increase in production in the 1st quarter of 1958 will occur as usual and plant management will watch this period closely to determine if the long overdue upturn in textiles is getting underway."

Elected at the annual meeting to serve on the Executive Committee were the following members: Robert Bendheim, Rock Hill Prtg & Fin Co, Rock Hill, S C; Homer Carter, Pepperell Mfg Co, Pepperell, Ala; Ernest J Chornyei, Bradford Dyeing Assoc, Westerly, RI; Gordon Coles, Fairforest Fin Div, Reeves Bros, Spartanburg, SC; A E Gutman, Harodite Fin Co, North Dighton, Mass; James Harrell, Delta Fin Co, Div J P Stevens Co, Wallace, SC; R H Jewell, Crystal Springs Bleachery, Chickamauga, Ga; Royce Pharr, USF-Aspinook Fin Div, Norwich, Conn; W F Robertson, Riegel Textile Corp, Ware Shoals, SC; Chas N Robertson III, Robertson Bleachery & Dye Wks, New Milford, Conn; Robert Sellers, Southern Bleachery & Prt Wks, Taylors, SC; Geo Sinkinson, Sayles Fin Plants, Inc, Saylesville, RI; W R MacIntyre, Jos Bancroft & Sons Co, Wilmington, Del; W O Forssell, Kendall Fin Plants, Bethune, SC; J Marshall Cole, Cold Spring Bly, Yardley, Pa.

In addition to the above, the following continue to serve their unexpired terms on the Executive Committee: Arthur G Poor, Standard Bly & Prtg Co, Carlton Hill, NJ; Julian Robertson, North Carolina Fin Co, Salisbury, NC; Sydney M Cone Jr, Cone Mills Corp, Greensboro, NC; Robert Amory, Grace Bly, Springs Cotton Mills, Grace, SC; E R Farrell, Mansfield Bleachery, Mansfield, Mass.

COTTON BROAD WOVEN GOODS, FINISHED*

(Million of Linear Yards)

	1953	1954	1955	1956	1957	Percent change 1957 vs 1956
Bleached & white finished	3,355	3,180	3,346	3,535	3,286	− 7.0%
Plain dyed & finished	2,454	2,308	2,671	2,572	2,508	− 2.5
Printed & finished	1,820	1,919	2,126	1,933	1,645	−14.9
Total	7,629	7,407	8,143	8,040	7,439	− 7.5%

(*) Data for 1957 estimated—other data from Bureau of Census.

VDI Names New Ad Agency

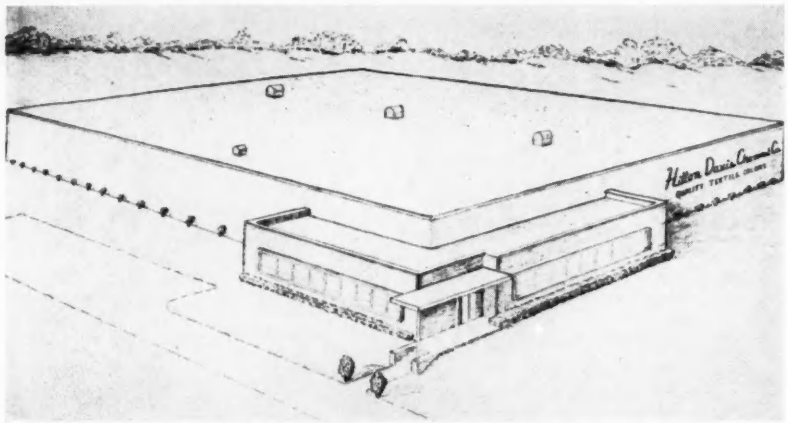
Anderson & Cairns, Inc, has been appointed advertising agency for the Vat Dye Institute, Inc, according to a recent announcement by John A Cairns, president of the New York agency.

OMCC Output of 98% Ethylene Diamine Underway

Commercial output of 98 percent ethylene diamine by the Organic Chemicals division of Olin Mathieson Chemical Corporation is now underway.

L E Russell, director of marketing, said that the desire for a more concentrated product by many ethylene diamine consumers has resulted in the addition of the 98 percent material to the Organic Chemicals division line. He said 85-88 percent and 90-93 percent of ethylene diamine will still be produced. There will be no change in the availability of polyamines 333 and 910.

Olin Mathieson's newly organized Organic Chemicals division will market ethylene diamine and polyamines formerly handled by the Industrial Chemicals division.



Artist's sketch of Hilton-Davis Chemical Co's Regional Headquarters Building in construction at Greenville, SC

Hilton-Davis to Construct Regional Hq in Greenville

Construction of a new building in Greenville, SC, as regional technical sales and distribution headquarters of the Hilton-Davis Chemical Company, Cincinnati, to serve textile mills in the South, has begun.

Management of the new operation and sales of its textile colors in the South will be under the direction of S Y Stribling, III. William S Pearson, J Dorman Compton, and Wilbur K Hammett will continue to serve as technical sales representatives in their respective southern sales territories.

Hilton-Davis first established a regional sales service center in Greenville in 1954. During the past three years the company has occupied some 11,500 square feet of leased space in two separate locations in the city.

Construction will start immediately and is scheduled to be completed in the Spring. The property is situated two miles north of Greenville on US 29.

When in operation, Hilton-Davis' new facilities will provide 20,000 square feet of space for administrative offices, technical service laboratories and a warehouse.

The new building will serve mills in North and South Carolina, Virginia, West Virginia, Georgia, Alabama, Tennessee, Louisiana, and Arkansas.

'58 ΔKΦ Convention

This year's convention of the Delta Kappa Phi Fraternity will be held April 24-26 at New Bedford, Mass. The New Bedford Hotel will serve as headquarters.

For further information and reservation requests, members should contact Joseph Corbeil at the New Bedford Institute of Technology.

TRI Seminar Schedule, Spring 1958

George Susich, Quartermaster Research & Development Center, Natick, Mass will inaugurate the Textile Research Institute's 1958 Spring Seminar Schedule on February 20th with a discussion of "Structural Alterations in Impacted Nylon Body Armor Fabrics".

All seminars will be held on Thursdays at the TRI laboratories, Princeton, NJ at 2:30 pm. Advance notice of planned attendance to Ludwig Rebenfeld, TRI, will be appreciated. The seminars are completely informal and no written reports are prepared.

The schedule:—

March 6—"Study of Polypeptide Chain Configurations"—W E Kauzmann, TRI and Princeton Univ.

March 20 — "Thermal and Flammability Characteristics of Fibers and Fiber Blends"—Irvin M Gottlieb, TRI.

April 3—"Development of Acrylic Fibers"—Charles R Stock, American Cyanamid Co.

April 17—"Crimp of Wool Fibers" —J H Dusenbury and J H Wakelin, TRI.

May 8—"Reaction Spinning of Fibers"—H A Pohl, Princeton Univ.

May 15—"Luster of Cotton and Other Fibers"—Lyman E Fourt, Harris Research Laboratories, Inc.

May 29—"Cellulose Derivatives"—G Hebblethwaite, TRI.

PTI Dedicates New Library Wing, Honors Former Trustees

Dedication Ceremonies for the new $50,000 wing of the Hesslein Library of the Philadelphia Textile Institute, School House Lane and Henry Avenue, Philadelphia, Pa were held Dec 10.

This addition contains, in addition to badly needed book racks, three conference rooms and a full storage basement. The Hesslein Foundation, New York, NY, donators of the library, also contributed microfilming equipment valued at $6,000.

The dedication was conducted with a tea attended by trustees, officials of the college and students.

The completion of this wing is the fourth major structure erected on the PTI campus since 1949. Others included a laboratory-classroom building, a seventy-five room dormitory, and the original library. A student union building is expected to be added late in 1958 or early '59.

* * *

Philadelphia Textile Institute honored two of its former trustees who passed away in 1957, Fred C Scholler, former chairman of the board, Scholler Brothers, Inc, and Millard D Brown, former chairman of Continental Mills, at a luncheon at the Alden Park Dining Room, Philadelphia, Pa, December 30, 1957.

Memorial certificates were presented, for Scholler to Lloyd O Koons, president, Scholler Brothers, Inc; and for Brown, to his son Millard L Brown, vice president, Continental.

Scholler, besides being a trustee of PTI, was president of the PTI Foundation from 1950 to 1956 and a generous supporter of the textile college.

Brown, one of the founders of the Foundation, was its first president, serving from 1945 to 1950. While president of the Foundation, he was instrumental in bringing about the detachment of PTI from the Philadelphia Museum and the development of the current campus.

GE Service Course on Recording Spectrophotometer

The General Electric recording spectrophotometer, a color-measuring device, will be the subject of a service course March 24 through 26 at the Company's Instrument Department, West Lynn, Mass.

Designed for users of the instrument and for other interested persons, the course will highlight servicing, maintenance, calibration and "common trouble-shooting techniques" bearing upon the spectrophotometer and its accessories.

The announcement said there is no charge for the course, or for materials to be used. Reservations may be made through Arnold Aronson at Instrument Department, General Electric Co, 40 Federal Street, West Lynn, Mass.

Morningstar, Nicol and Paisley Products Merge into Morningstar-Paisley, Inc

Morningstar, Nicol, Inc, producer of starch and chemical products, and its principal industrial adhesives manufacturing subsidiary, Paisley Products, Inc, have been merged to form a single corporation, Morningstar-Paisley, Inc. The new corporation name emphasizes the two major segments of the organization: Morningstar, with its starches, water-soluble gums, and dextrines, and Paisley, one of the larger manufacturers of packaging adhesives, polyvinyl acetate, latex, and plastisol products. Morningstar adopted the Nicol name in 1930, when it absorbed J M & J S Nicol Co, one of the first dextrine producers in this country; Nicol is now one of the company's smaller divisions. Also absorbed into the new corporation are several subsidiaries including Haberland Mfg Co and Federal Adhesives Corp, both acquired last fall. Hayes Adhesive Co, Inc, St Louis, Mo, and Aroostook Potato Products, Inc, Houlton, Me, will continue as separate subsidiary corporations.

According to Joseph Morningstar, chairman of the board, the simplification of corporate structure will strengthen the organization by integrating and coordinating activities in the manufacturing, research and development, sales, advertising, and financial divisions of the company.

Simultaneously with this merger, the several West Coast subsidiaries of Morningstar and Paisley have all been absorbed into Morningstar-Paisley, Inc of California.

Shell to Construct New Process Development Lab

Ground has been broken for a new, half-million dollar process development laboratory at Shell Development Company's Research Center at Emeryville, Calif.

According to A J Johnson, vice president—development, the new laboratory will provide a valuable "test tube-to-manufacturing plant" stepping stone during the development of new petroleum products and petrochemicals.

The building, covering some 10,000 square feet of ground space, will be three stories high. Portions of its interior will be open from ground to roof to allow indoor construction of 35-foot models of distillation columns and absorption towers which in full scale will rise more than 100 feet.

William E Breagy, right, sales representative for Warwick Chemical division of Sun Chemical Corp, presents a Polaroid Land camera to Carl H Brubaker, research director, Standard Bleachery and Printing Company. Mr Brubaker won the camera in a drawing held at the Warwick Chemical exhibit at the 1957 AATCC Convention held in the Hotel Statler in Boston.

K & B Wool Finishing Machines Available in U S

Wool-finishing machinery manufactured by Kettling & Braun, Minden/Westf, West Germany, is again being offered to U S woolen mills through the firm's U S agents, Ernest L Frankl Associates, 515 Madison Ave, New York 22, NY.

K & M machines were brought into this country in quantity prior to World War II. The original plants were located in Eastern Germany, but since 1950 entirely new manufacturing facilities have been established in West Germany. All the technical personnel of the original firm escaped to the Western Zone, forming the nucleus of experienced technicians at the new plant.

During the last few years, Kettling & Braun reportedly has developed an improved line of machinery, applying the latest technological advances and requirements of automatic operation to wool-finishing equipment.

Kettling & Braun manufactures, among others, 24-roll nappers, wet decating machines, automatic finish decating machines, automatic high-luster full decating machines, wet and dry brushing machines, cylinder presses, suction humidifiers, cloth shearing machines, full-width carpet-shearing machines, multilayer tenter frames, carbonizing machines, etc.

Initially, particular emphasis will be placed on the automatic full decating machine, which is said to produce a first-class finish in automatic operation with a production of better than 3,000 yards per eight-hour shift.

Experienced technical personnel will be available to advise U S mills on wool-finishing problems.

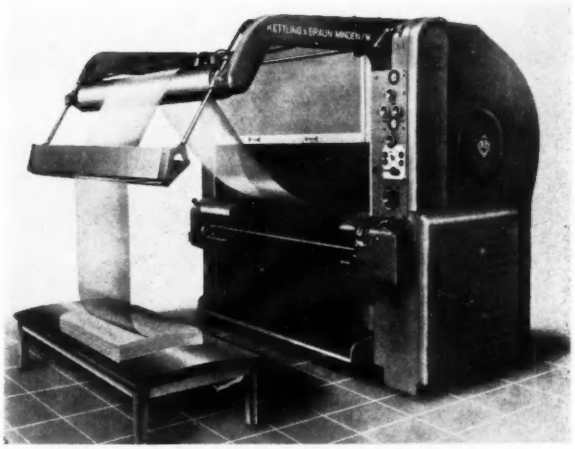
Chemstrand Fund for Scholarships,Grants-in-Aid

The Chemstrand Corporation has established a fund to provide undergraduate scholarships and grants-in-aid at 30 US colleges and universities.

The scholarships are for upperclass students, preferably seniors, in the fields of textiles, chemistry, physics, chemical, mechanical, and electrical engineering, business administration, industrial management, and the liberal arts.

The scholarships are awarded and administered by the individual colleges. The purpose of this program "is to assist financially in the academic training and development of scientists, engineering and management personnel."

The grants-in-aid will be used by the institutions for the purchase of equipment or to supplement salaries.



Kettling and Braun Finish Decating Machine, Model "Planet Automat"

Borden Chemical Div Renamed

The expanded and diversified chemical business of The Borden Company has been given a new name: The Borden Chemical Company, Division of the Borden Company. It formerly was known as the Borden Company Chemical Division.

The first name given this phase of business was the Casein Manufacturing Company of America, Inc, a subsidiary formed when Borden's acquired the Casein Company of America in 1929. The name of this corporation was changed to the Casein Company of America, Inc, in 1936. Two years later it became a division of The Borden Company. It retained the "casein" designation for a total of nearly 20 years, because the operations at first were primarily concerned with manufacture of adhesives from casein, a by-product of milk.

Borden's began to diversify and expand its chemical business in 1939, when the company introduced the first synthetic resin adhesives to this country. The following year it began production of phenol-formaldehyde adhesives and in 1942 developed resorcinol-formaldehyde adhesives. The Borden Company Chemical Division name was adopted in 1948.

Today, the company's chemical operations include 17 domestic plants and eleven others located outside the United States. Borden's manufactures include formaldehyde, polyvinyl chloride and other resins and plastics, as well as many specialized products for the textile, paper, and paint industries. Its adhesives formulations find applications in most key industries.

NCSC School of Textiles "Open House"

The School of Textiles of North Carolina State College will present its semiannual "Open House" program Saturday, March 1.

The day's program will include conducted tours through the school during which all phases of textile fabricating from yarn preparation to weaving, knitting, dyeing and finishing will be explained and demonstrated.

Exhibits from manufacturers in all branches of the North Carolina textile industry will also be on display. A leading clothier will present fashion shows at 11 am and 3 pm. Entertainment will be furnished by a Raleigh dance studio.

A wide range of colorful and useful items made at the State College School of Textiles and by North Carolina manufacturers will be given away throughout the day's activities.

Spots may look good on a toy leopard, or on model Pat Dlouhy's corduroy sheath, but the message of "Scotchgard" brand stain-repeller, premiered at the recent January Furniture Show in Chicago by Kroehler Manufacturing Co, is that "the spotless look"—free from oil or water-borne stains, and ordinary household dirt —is the desirable thing in upholstery. The stain-repeller, featured by Kroehler on 21 fabrics, including 3 cotton prints, is a product of Minnesota Mining and Manufacturing Co.

Fabulized Announces Six New Licensees

At a demonstration held recently at the Waldorf Astoria, New York, NY, John L Fancourt, president of Fabulized, Inc, announced the appointment of six new licensees for Fabulized, a recently introduced finish designed to render synthetic fabrics absorbent. The finish presently has application in sixty different field's of women's, men's and children's apparel, domestics, piece goods, and miscellaneous catagories, it is stated.

Charles H Bacon Co, hosiery manufacturer with mills in Lenoir City and Loudon, Tenn, reportedly will Fabulize ladies' full-fashion hosiery in 60-gauge, 15-denier sheers with plain and dark seams; 60-gauge twin-thread sheers in plain and dark seams; and 400-needle, 15-denier deluxe seamless in plain and micro mesh. The Bacon Company also plans to Fabulize infants', children's and misses' nylon stretch anklets.

Carillon Lingerie Co, New York, another new licensee, is "Fabulizing" its spring line of nylon tricot lingerie. Other new licensees include the Adirondack Finishing Corp, Johnstown, NY, a custom dyeing and finishing mill; Fox-Wells Tricot Division, New York; E Schulze & Sons, Reading, Pa, a finishing mill specializing in dyeing and bleaching of hosiery; and Lee Dyeing Co of Canada, Ltd, Lachine, Quebec, which has been licensed to Fabulize nylon tricot.

"Engineering" Shrink-Proof Wool Fabrics

Harris Research Laboratories, Inc, Washington, DC, is working on a project, sponsored by the Wool Bureau and the International Wool Secretariat, under the supervision of Gerald Laxer, aimed at engineering shrink-resistant wool fabrics. The object of this study is to learn what combination of wool fiber, yarn, and fabric structure elements will yield wool fabrics which will have maximum resistance to felting shrinkage when washed in modern washing machines. Work to date on this project to date reportedly has shown that, under modern washing conditions, utilizing short washing times, slow agitator speeds and higher water levels, woolen fabrics shrink about half as much as they did when washed in the old-type tumble washer. Study of over 75 commercial wool fabrics reportedly has shown that fabric compactness is the most important factor in producing fabric resistant to felting during laundering. The influence of fiber and yarn properties is now being determined by analysis of the structure of numerous fabrics. Based on results to date, it appears probable that fabrics can be constructed so that they will give satisfactory performance during laundering with only moderate or no antifelting treatments.

In accordance with International Wool Secretariat policy, this information will be published shortly for use by all in the industry. A progress report on the work was presented recently by Herman Bogaty at the Delaware Valley Section of the AATCC.

Ground Broken for New P&S Plant

Ground was broken January 9th by P Kay Schwartz, president of Proctor & Schwartz, Inc, Philadelphia textile machinery manufacturer, for a new plant to be built at Waynesville, NC.

Among the dignitaries present at the ceremony was Max Watson, personal representative of Governor Luther Hodges, and a member of the State Board of Conservation and Development; Claude N Allen, president, Haywood Improvement Foundation.

The ground breaking marks the start of a 72,000 sq ft building situated on a 27½-acre site along the Southern Railway track between Waynesville and Lake Junaluska. The plant will be used first for the manufacture of textile-fiber processing machinery. Later, the company plans to add manufacturing facilities for drying equipment, and equipment for tobacco processing.

• NAMES IN THE NEWS •

Flett

Cannon

Sanders

Mobley

Lawrence Flett, consultant, National Aniline Div, Allied Chemical & Dye Corp, has been chosen unanimously to receive the 1958 Gold Medal of the American Institute of Chemists "in recognition of his research achievements, his devotion to the profession of chemistry, and his long and unselfish promotion of the professional welfare of fellow chemists through the medium of scientific societies."

The presentation of the Gold Medal will be made to Mr Flett, a past president of AIC, during the Annual Meeting of the Institute to be held April 10-11, at the Ambassador Hotel, Los Angeles, Calif.

Fred J Emmerich, past chairman of the board of directors of Allied Chemical & Dye Corporation, New York, has been chosen to receive the Chemical Industry Medal for 1958 "for conspicuous services to applied chemistry." Announcement of the award was made February 2nd by the American Section of the Society of Chemical Industry, donor of the medal. Formal presentation of the medal to Mr Emmerich will be made at a meeting of the American Section following a dinner in the medallist's honor at the Royal York Hotel, Toronto, Ontario, on Thursday evening, September 18, 1958. The medal presentation will be the American Section's principal part in the annual meeting of the whole Society of Chemical Industry as guest of its Canadian Section.

William H Bowman of American Cyanamid Company, chairman of the American Section, will present the medal to Mr Emmerich.

Wayne H Lawson, formerly with Hans C Bick, Inc, was recently named technical sales representative for Virkler Chemical Co, Philadelphia, Pa.

Campbell

A reorganization of the field sales activities of the Chemical Division of Eastman Chemical Products, Inc, into three regional areas and the appointment of regional sales managers have been announced. Eastman Chemical Products, Inc is a subsidiary of Eastman Kodak Company and markets the products of two of Kodak's principal chemical manufacturing divisions, Tennessee Eastman Company and Texas Eastman Company.

The newly appointed regional sales managers include **Robert H Cannon,** who has been in charge of the Chemical Division's New York office for the past several years. Cannon will now direct the sales of chemicals and dyes in the New England and Middle Atlantic states including the operation of the company's distribution center at Lodi, NJ.

John H Sanders becomes regional sales manager for those areas served by the division's Cleveland, Cincinnati and Greensboro, NC, offices plus other areas of the south and southeast. Sanders was formerly in charge of the division's Cleveland office and, more recently, product manager for all chemicals produced at Kodak's Texas Eastman Company division.

Decatur B Campbell Jr has been appointed regional sales manager of the midwestern area and as such will direct the sales of the division's products in those areas served by the company's Chicago, St Louis and Houston offices. Prior to the new appointment Campbell was in charge of the division's Chicago office.

E Taylor Mobley has been appointed manager of Ciba Co, Inc's Southern District, succeeding **Samuel L Hayes,** who retired January 1st.

Mr Mobley joined Ciba's Sales Division in Charlotte in May, 1949, following nine year's service with General Dyestuff Corp as a dye and chemical sales representative.

He has been an AATCC member since 1932.

Carnegie Institute of Technology has announced the appointment of **Jules Labarthe** as professor of textile technology.

Dr Labarthe will play a major role in developing a new program in textile technology in the Department of Home Economics of Margaret Morrison Carnegie College. The program will prepare young women for positions in business and industry.

For the past twenty-seven years, Dr Labarthe has been Senior Fellow on the Commodity Standards Fellowship maintained at Mellon Institute by the Kaufmann Department Stores of Pittsburgh. He joined the staff of Mellon Institute in 1922.

Henry D Grimes, youngest charter member of the AATCC and a former chairman of the Northern New England Section, recently completed his second world-circling tour within 18 months on behalf of Y's Men's International. Mr Grimes was first elected secretary-treasurer of this organization in 1925 and was reelected annually through 1954. As of January 1st, 1955 he became the first and only full-time employed officer of the association and at that time resigned as director of research and development for the American Woolen Co. Mr Grimes has crossed 80 borders and visited 60 countries in the course of his travels during the past 2½ years. Y's Men's clubs is a world fellowship of YMCA members in 600 clubs found in 32 countries.

Brandt

Walter R Brandt has been appointed branch manager of the West Coast Sales office of General Dyestuff Company, and in addition will act in the capacity of Western Regional Manager for Antara Chemicals. General Dyestuff Company and Antara Chemicals are sales divisions of General Aniline & Film Corporation.

For the past six years, Mr Brandt has been manager of textile, paper and leather chemicals in the Company's main sales offices at 435 Hudson Street, New York.

In his new position, Mr Brandt will be in charge of sales of dyestuffs, pigments and chemicals for the entire West Coast. He will make his headquarters at the Company's San Francisco, Calif, branch office.

Mytelka

Morris Mytelka, formerly chief chemist in charge of the laboratory at Dexter Chemical Corp, is no longer associated with the firm. Mr Mytelka had been with Dexter for the past 12 years, and prior to that time had spent 10 years with Hart Products Corp.

Six technical representatives, who have completed their training in the General Sales Office in New York, have been assigned to district offices of Union Carbide Chemicals Company, Division of Union Carbide Corporation.

The assignments are: William C Friedemann to the Houston District; Thomas M Fulton to the Los Angeles District; Gordon H Heggland to the Cincinnati District; Nicholas J Hill to the St Louis District; James R Leusch to the Boston District; and J Thomas Revell to the Newark District.

Nye

May

Sun Chemical Corp has announced the appointment of Frank May as general manager of Ansbacher-Siegle Corp, a recently acquired division, and the promotion of Stephen Nye to the newly created post of manager, Southern Textile Application Laboratories of its Warwick Chemical Division.

Mr May replaces Eric Blackstead, who was recently elected a vice president of Sun Chemical Corp and general manager of its chemicals group. Mr May joined Ansbacher-Siegle in 1957 as plant manager.

Mr Nye will be located at Warwick's Rock Hill, SC, plant. He has been with Warwick since 1953 as manager of the Company's application laboratory at Wood River Jct, RI.

American Society for Testing Materials Committee D-13 on Textile Materials will present the Harold De Witt Smith Memorial Medal to Stephen J Kennedy, research director, Textile, Clothing, and Footwear Division, Quartermaster Research and Development Center, Natick, Mass. The presentation will be made on Thursday, March 20, during the Spring Meeting of Committee D-13, March 18-21, at the Sheraton-Park Hotel, Washington, D C.

The medal is a testimonial to the memory of the late Harold De Witt Smith who pioneered in the concept of an engineering approach to the evaluation of the properties of textile fibers and to their utilization. It was endowed by Fabric Research Laboratories, Inc, Dedham, Mass, and is awarded at intervals of not less than one year by Committee D-13 for outstanding achievement in research on fibers and their utilization. This is the ninth time the medal has been awarded.

OBITUARY

LEONARD S MOLENDYKE, 42, sales representative for American Aniline Products, a unit of Koppers Co, Inc, in the Paterson, NJ area.

Mr Molendyke, who joined AAP in 1947, was formerly head dyer at Puritan Dye Works and a member of the Metropolitan Section, AATCC.

Luthy

J W Luthy has been appointed director of applications for the Dyestuff and Chemical Divisions of Sandoz, Inc.

In the new post he will be responsible for all research and development, including customer service on technical problems of the wide variety of uses for the products of the two divisions. He will headquarter at Sandoz's New York offices at 61 Van Dam St.

Dr Luthy joined Sandoz in 1948 as a chemist in the company's Fair Lawn, NJ, works. He was made head of the applications laboratory of the Chemical Division in 1951, and in 1954 was named director of promotion and applications.

Smith

Transfer of C H Smith from the Philadelphia to Minneapolis field office of the Goodyear Tire & Rubber Company's Chemical Division has been announced.

As a special representative, he will provide sales and technical service for all products marketed by the Goodyear Chemical Division. These include high polymer rubbers, resins and latices.

Mr Smith joined Goodyear in 1955.

Preston G Baker Jr, a junior at the School of Textiles, North Carolina State College, has been awarded the Owens-Corning Fiberglas Corp scholarship award for the current year.

Under the terms of the scholarship, Baker's tuition and fees will be paid, and he will receive $500 per college year. The award may be renewed in his senior year of study.

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